

modern machine shop

HOT-SIZING
SPACE VEHICLE
ALLOYS

See Page 122

FACTS ABOUT
CUTTING
FLUIDS

See Page 140

SEPTEMBER 1959

Precision Boring for Production Tape-controlled FOSMATICs

Write to see why . . . THE FOSDICK MACHINE TOOL COMPANY
Cincinnati, Ohio



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on the Rocks!

It's "refreshing" to know — American provides drill jig bushings for every tooling purpose. We serve them to your "taste", to satisfy your job requirements. This is an *American* tradition.

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of the World

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Member



A Statement of Policy

The principal function of MODERN MACHINE SHOP is to search out and disseminate the best and newest ideas for the advancement of engineering skill and mechanical efficiency in the metalworking industry, and neither effort nor expense is, or shall be, spared in the performance of this task.

features in

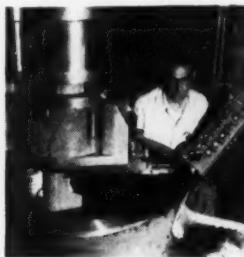
Assembling & Finishing...Inspecting, Testing & Control...
Press Working...Management & Safe Practices...Materials
& Processes...Production Machining...Tooling & Design

MACHINING PARTS FOR POWER GENERATORS

By Fred W. Vogel

This article illustrates and explains in interesting detail the application of unprecedented machine tools required in the manufacture of electric power generating equipment at the Large Steam Turbine-Generator Department of General Electric.

Page 108



HIGH SPEED GRINDING OF PRINTED CIRCUITS

By Bartlett West

Burrough's plant uses abrasive belt equipment to surface both sides of copper-clad printed circuit boards for complex electronic equipment built for business and defense.

Page 120

HOT-SIZING—A REMEDY FOR SPACE-AGE WRINKLES

By Gilbert C. Close

MMS Field Editor Close reports on a process that is designed to permit difficult-to-work alloys to be finish-formed faster and more economically without post process warpage.

Page 122

HOW TO SET A DIAL BORE GAGE

By Douglas C. Cunningham

The author discusses a number of important factors which should be remembered in setting a dial bore gage to a master.

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this issue

SEPTEMBER 1959 • VOL. 32 • NO. 4

MACHINING STAINLESS STEEL

By G. J. Stevens

Case history points out how a change of drill grind minimized burr formation and increased tool life in drilling Type 302 stainless steel tubing.

Page 132

VACUUM PROBE SOLVES PROBLEM IN MILLING AIRFRAME PARTS

By H. F. Robinson

Simple plug-on warning device monitors vacuum clamping force which is applied to airframe parts during the machining cycle to provide maximum safety to operator.

Page 134

HOW TO SOLVE YOUR SUPERVISORY PROBLEMS

By Alfred M. Cooper

The problems of stress in modern industrial supervision and solutions to these problems are the subject of this month's discussion by Mr. Cooper.

Page 138

FACTS ABOUT CUTTING FLUIDS

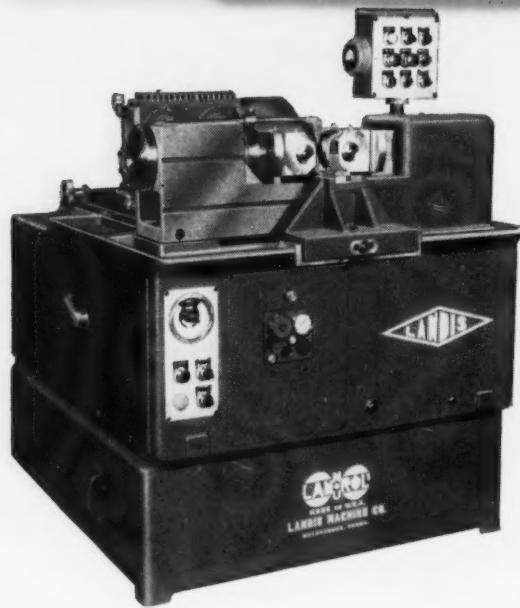
By E. J. Ritter

In this discussion on materials that are designed to help cut metal easier, faster, or better, the author confines his informative remarks to two principal types of metal-cutting fluids — those which are based on water and those which are based on oil.

Page 140



modern machine shop



a new **LOW-COST** thread rolling machine

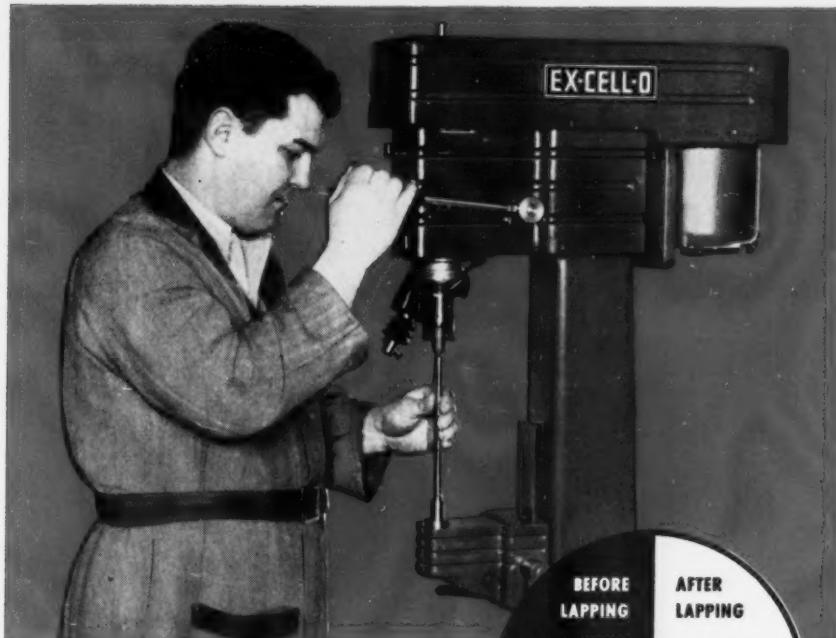
LANDIS Research has now developed the LAN-NU-ROL Thread Rolling Machine—designed to meet the requirements for jobbing or high production thread rolling operations.

The LAN-NU-ROL's design concept is formed on the bases of simplicity, rigidity, power, accuracy, versatility, low first cost, low die cost and uncomplicated set-up and service. It is ideally-suited for Thrufeed Rolling and a full complement of automatic feeding equipment is available for threading by this method. Although intended primarily for hand-loaded Infeed Rolling operations, automatic feeds can be supplied for Infeed Rolling whenever practical.

The LAN-NU-ROL will thread all diameters up to 2" by Infeed Rolling and up to 1" by Thrufeed Rolling, depending on workpiece material and thread specifications. It will produce left- and right-hand threads of all types (except square), including UNC, UNF, Acme, Worm and many special forms.

DESIGN HIGHLIGHTS include: **TWO-DIE DESIGN**—minimizes die cost, set-up time and auxiliary equipment; **PNEUMATICALLY-OPERATED**—hydraulically-operated (optional) . . . allows a high infeed cycling rate . . . up to 60 cycles per minute; **MANUAL, SEMI-AUTOMATIC and AUTOMATIC DIE CYCLING**; **TOGGLE-OPERATED INFEED SYSTEM**—develops brute rolling pressure with maximum thermal stability and minimizes stress deflection; **INFINITELY VARIABLE SPINDLE SPEEDS**—166 to 500 RPM; **INTERCHANGEABLE TOOLING SYSTEM**. Ask for Bulletin E-101.

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September, 1959

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WADE 94 ELECTRIC CLUTCH HAND TURRET LATHE

CONTROL CENTER Ease of operation is one of the principal reasons for using any hand turret lathe. The Wade "Model 94" shown here performs more quickly and more accurately than a larger, more cumbersome machine of the same type — on the same work. The Wade Control Center provides the ultimate in effortless control of all functions.

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THE WADE TOOL CO.

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new

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The completely new GREAVES No. 2-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . at the cutter!

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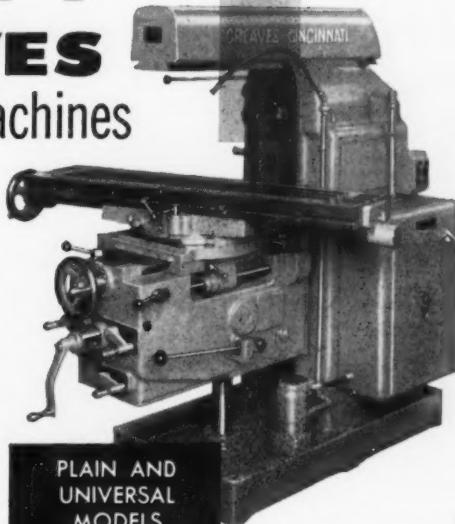
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more
power at
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- Wide range of speed/feed combinations for any type material, any type job.
- Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
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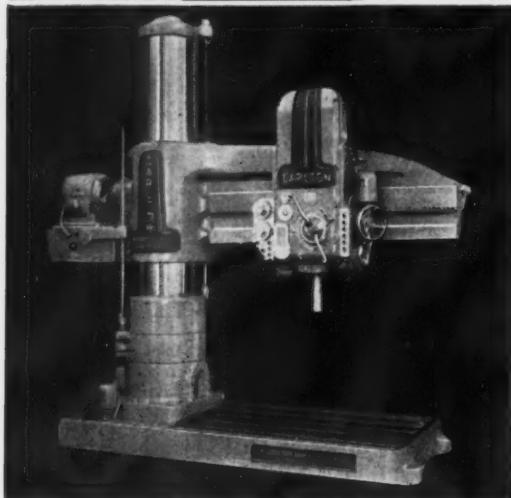
Model	Column diameters	Arm lengths	Speeds		No.	Feeds	Motor recommended
			No.	Range			
8A	9"	3'-4'	8	20 to 1	4	.006-.020	3-hp
1A	9" 11"	3'-4" 3'-4-1/2"	12	25 to 1	6	.006-.025	5-hp 5 or 7-1/2-hp
3A	13" 15" 17"	4'-5" 4'-5-1/2" 5'-6'-7"	36	100 to 1	18	.004-.125"	7-1/2, 10, 15, 20 or 25-hp
4A	19"	6'-7'-8"	36	100 to 1	18	.004-.125"	15 to 40-hp
5A	22" 26"	7'-10' 8'-10-1/2"	36	100 to 1	18	.004-.125"	20 to 40-hp

*8, 11½, 14 and 18 threads per inch are standard, with various other combinations available.

†Driving motor larger than 40 hp can be used if desired.

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OA 1A 3A 4A 5A



Carlton is the *only* radial drill to bring you all these advantages:

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Carlton

Specialists in radial drills

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with a catcher's mitt . . .



playing ball or cutting steel,
use the "tool" designed for the job!



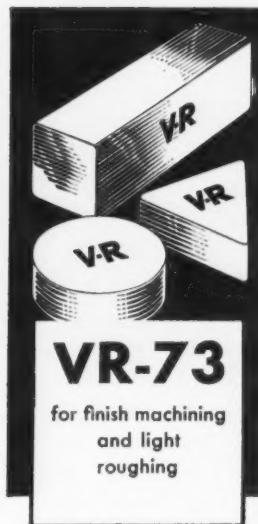
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for heavy roughing
and interrupted
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general purpose
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for finish machining
and light
roughing

Each carbide grade has been specially engineered and field proven for the correct balance of wear resistance, shock resistance and heat resistance to handle a specific range of operations. These superior V-R carbide grades cover the complete range of operations for machining all types of steel and the new superalloys . . . setting new standards of carbide tooling performance in hundreds of plants. V-R engineers will be glad to help you select the carbide grade engineered for your job. Contact your nearest V-R representative or write for complete information. *Ask for Bulletin 5803 on V-R grades.*



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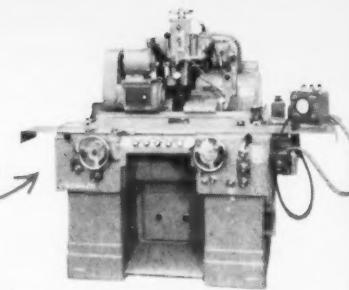
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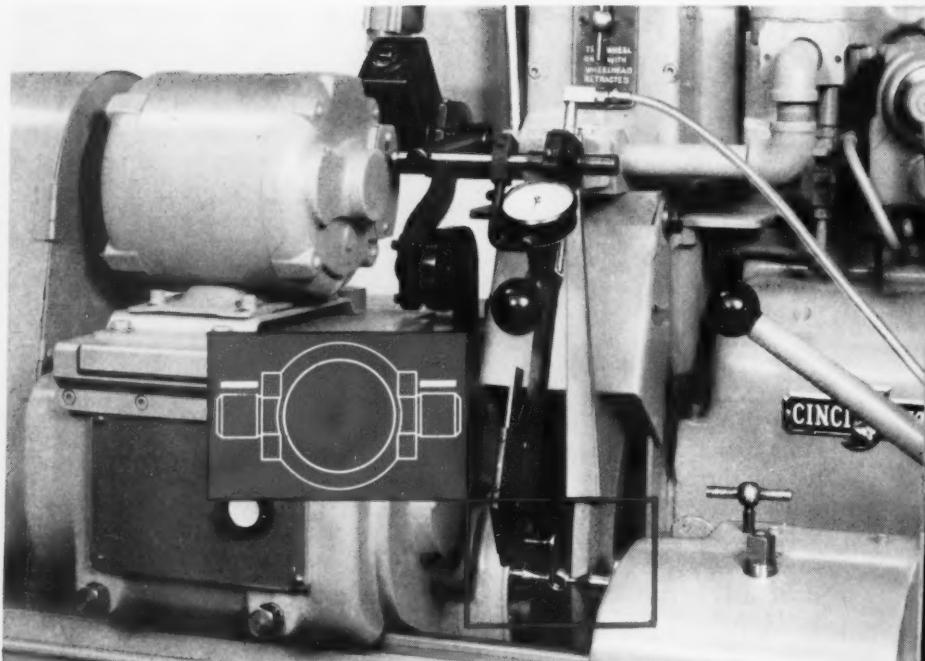
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Work ground on this



Accurate



BEARING DIAMETERS on small super-accurate spiders are ground to a roundness and size within millionths on this CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Inset: Heavy lines in drawing of part indicate ground diameters. Production, 50 per hour at 80% efficiency.

BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTR
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI is



within Millionths

Accuracy begets accuracy. Cincinnati equipped this 4" Plain Grinder, a fine machine in its standard attire, to obtain an amazing degree of repetitive accuracy on production work . . . *sizing and roundness are within millionths.*

Equipment for extra close accuracy includes: two-piece footstock with taper slide for zero alignment of the center . . . super-accurate automatic air-electric gage sizing . . . hydraulic truing. The coolant tank and pump are isolated from the machine, and incorporate a filtering unit. Exclusive FILMATIC spindle bearings are utilized in the headstock as well as in the grinding wheel spindle mounting. In addition, extra operations are performed in fitting and assembly.

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CINCINNATI®
GRINDING MACHINE DIVISION

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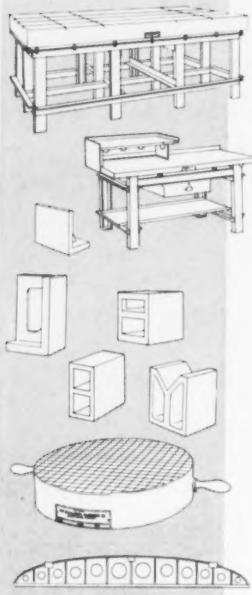
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need to hold CLOSER TOLERANCES?



HERE ARE OVER
**300 AIDS to
PRECISION
PRODUCTION**



More than 300 different items are available in the Challenge Precision Surface Equipment line to help you maintain close control of accuracy in your tooling, manufacturing assembly and inspection operations.

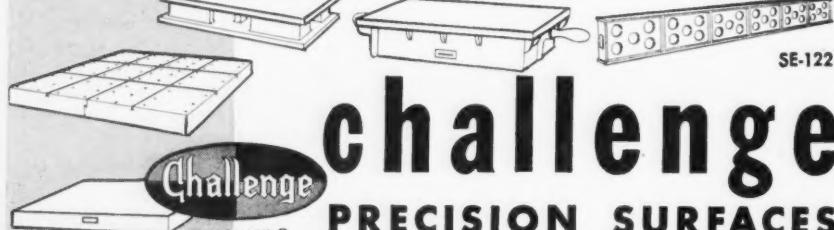
These include both Granite and Semi-Steel Surface Plates of all types and sizes. Also Semi-Steel Angle Plates, V-Blocks and many other items of precision surface equipment. In addition, many special sizes and types can be made-to-order.

Take this important step toward cutting costs and minimizing rejects. Get information on Challenge Precision Surface Equipment to improve your operations.

SEND FOR THIS HANDY FREE CATALOG
covering description and prices on all standard items.

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

SE-122



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PRECISION SURFACES

for LAYOUT • INSPECTION • ASSEMBLY
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High cutting speeds! Microbore titanium carbide and ceramic tips cut at speeds and feeds impossible with any other type tips, yielding excellent surface finish . . . in some instances comparable to ground finish. Micrometer vernier adjustment sets the tool point in seconds to accurate part dimensions. Extreme rigidity of basic design, double cone bearing and axial locking force; plus minimum tool point overhang, makes Microbore ideal for these new cutting edges. *Like all Microbore cutting tools, the new tips are cone relief ground to gage room accuracy.* Microbore titanium carbide and ceramic tipped tooling are major developments in the complete Microbore system of precision cutting tools.

Cone relief has uniform clearance around profile of cutting edge for maximum tool life.



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DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY
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214

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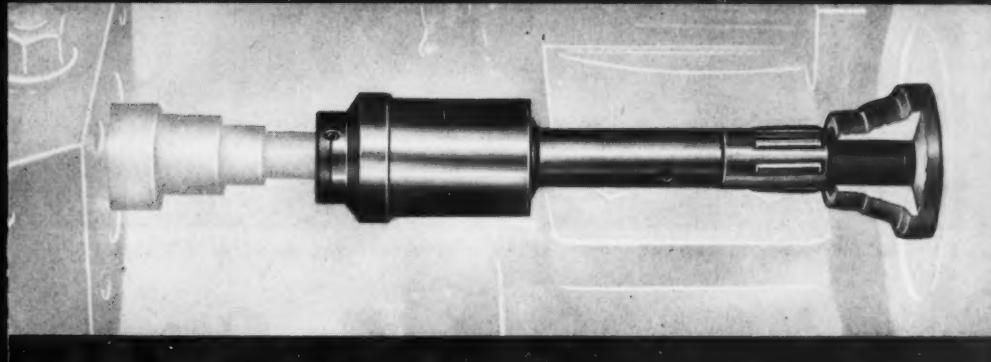
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from 125 to 5 micro-inches



surface
finish

in one 5-second pass!



with the revolutionary **microller** burnishing tool

- Finishes roughest bored or turned surfaces (ie: 200 mu-in. and higher) to finishes of 4 micro inches and lower.
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- Finishes all machineable metals . . . all types of surfaces; internal and external cylindrical . . . tapered, radial, flat.
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- Sizes in increments of .000025" or less . . . performs sizing operations never before possible. Invaluable for sizing bearing seats, oilite bushings, parts out of tolerance, etc.
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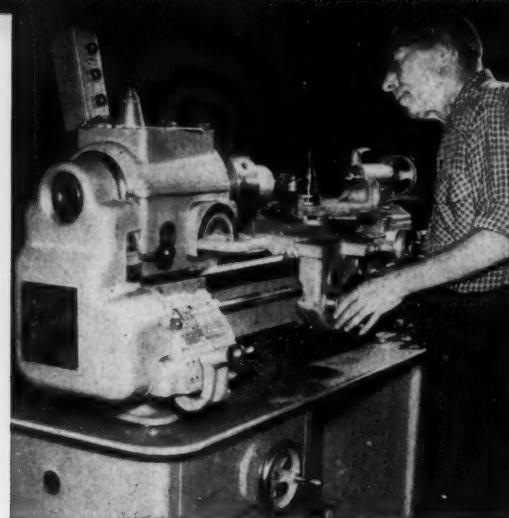
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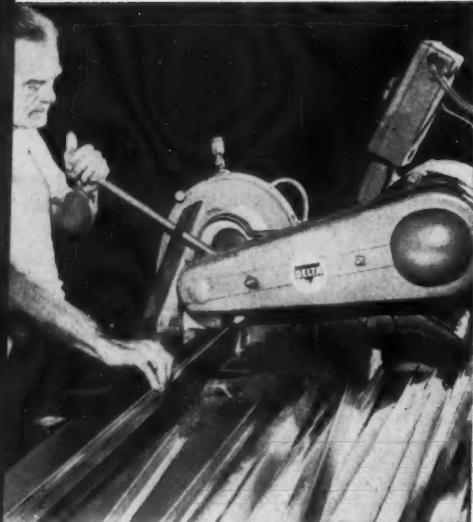
20" Drill Presses, 28 Models



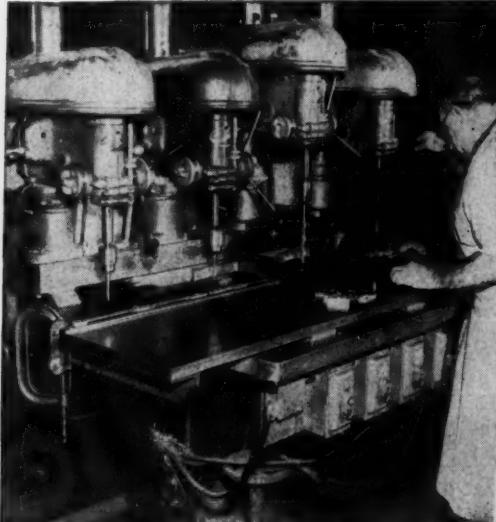
11" Metal Lathes, also 10" (4' and 5' Bed)

ON ANY SIZE JOB

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Cut-off Machines, Wet & Dry Abrasive,
Non-Ferrous and Wood



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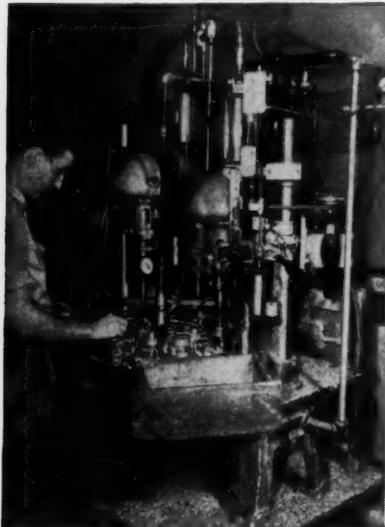


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14" Drill Presses, also 14"
Super-Hi Sensitive and 15"

You'll save money three ways when you put Delta Tools to work in your shop: they cost less to buy, less to operate, and less to maintain. They're ruggedly built to withstand hard wear, yet are completely mobile—offer you precision to meet the most exacting requirements.

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See Delta Industrial Tools at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

DELTA INDUSTRIAL TOOLS

another fine product by

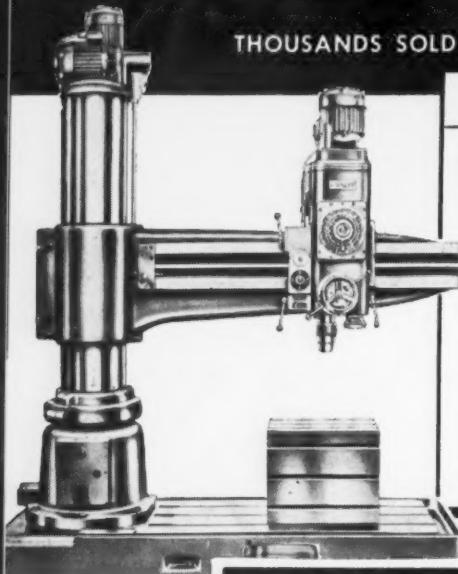
ROCKWELL



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IMPERIAL RADIAL DRILLS

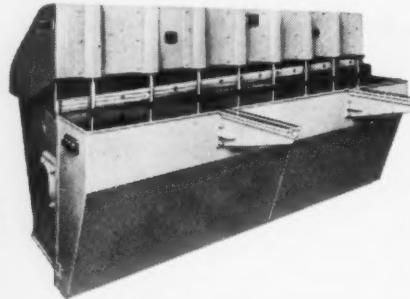
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L-3	8 1/4	3'	\$2195.
M-3PE	10	3'	\$3995.
M-4PE	12 1/2	4'	\$4985.
M-5PE	14	5'	\$6295.
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WIEGER
Guillotine
Shears



- ALL STEEL CONSTRUCTION
- SINGLE STROKE CONTROL
- PERMANENT ACCURACY

8" gaps on all models. Cuts thin and heavy gauge accurately.

Length	Capacity	Price
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8'	12 gauge	\$4395.
10'	12 gauge	\$5195.
6'	3/16 inch	\$5190.
8'	10 gauge	\$5495.
10'	10 gauge	\$5795.
6'	7/32 inch	\$6190.
8'	3/16 inch	\$6495.
10'	3/16 inch	\$6795.

AARON MACHINERY CO., Inc.

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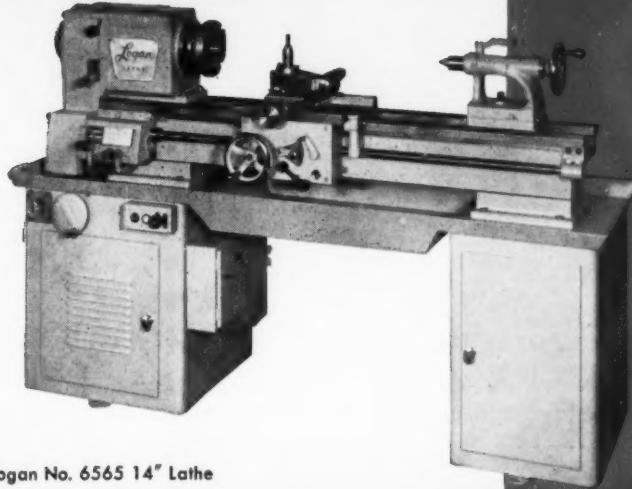
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BRANCHES AT:
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SEE OTHER AD ON PAGE 29

its specifications add up
to high production capacity

Logan
14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-capacity features. For instance—

- An oversize spindle with 1½" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The complete specifications tell the story. Write for them.

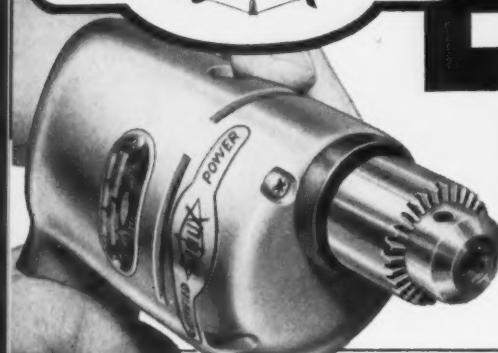
- Spindle speeds to 2000 rpm
- 1½" Levermatic collet chuck capacity
- 14½" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

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CERTIFIED



POWER



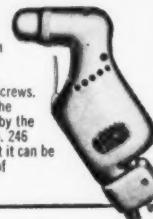
NO. 260 - 262

On No. 260 Super Screwdriver the operator controls the tightness with which a screw is set by the amount of pressure he applies. The $\frac{1}{4}$ " Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket head (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models equipped with reversing switch.

SIOUX ELECTRIC SCREWDRIVERS

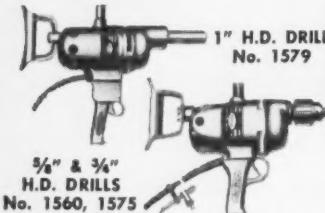
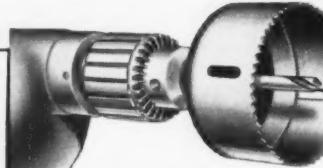
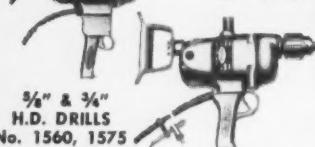
NO. 242

It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 245 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.



SIOUX HIGH-SPEED STEEL TEETH HOLE SAWS

will cut holes from $\frac{5}{8}$ " to 6" in diameter, in any free machining material to a depth of $1\frac{1}{4}$ ". Alloy or stainless steel may be cut at slow speed. High-Speed teeth welded to chrome-vanadium body give maximum life and cutting ability.

1" H.D. DRILL
No. 15791/2" H.D. DRILL
No. 15501/2" STD.
DUTY DRILL
No. 15101/2" SLOW SPEED
DRILL No. 1548

POWER* SPECIFICATIONS SIOUX ELECTRIC DRILLS

When it's a SIOUX you know what it will do

Catalog Number	No Load Speed	H.P. and R.P.M. at Load Speed	Oz. Ft. Torque at Load Speed	H.P. and R.P.M. at Peak Load Speed	Oz. Ft. Torque Peak Load
1475	2250	5/64 1525	4.9	7/64 1050	8.8
1480	1600	7/64 1140	7.9	5/32 790	16.8
1485	1650	3/32 1060	6.9	1/8 620	16.7
1495	1650	3/32 1060	6.9	1/8 620	16.7
1498	400	3/16 275	45.0	9/32 215	108.0
1510	525	27/64 370	95.0	39/64 230	222.0
1517	925	13/32 670	49.0	9/16 540	135.0
1519	1250	13/32 860	37.5	9/16 500	96.0
1525	1650	5/16 1060	31.0	3/8 680	45.0
1541	925	13/32 670	49.0	9/16 540	85.0
1548	525	27/64 370	95.0	39/64 230	222.0
1550	525	7/16 325	108.0	17/32 175	252.0
1560	400	9/16 260	175.0	3/4 155	400.0
1575	400	3/4 205	308.0	1-1/8 125	748.0
1579	350	49/64 200	315.0	1-9/64 115	800.0
1472	1600	13/64 960	17.8	17/64 720	32.4
1473	950	13/64 575	31.6	17/64 430	55.0
1474	625	13/64 375	44.6	17/64 280	84.2
1477	950	13/64 575	31.6	17/64 430	55.0
1478	625	13/64 375	44.6	17/64 280	84.2
1479	1600	13/64 960	17.8	17/64 720	32.4



*for
complete
specifications

SEE THE
NEW
SIOUX
CATALOG

when it's a SIOUX

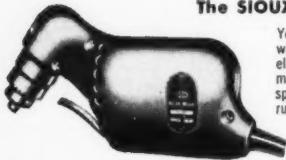
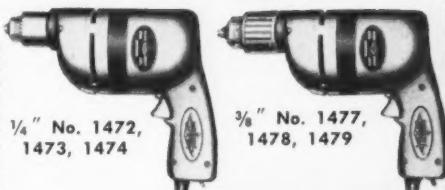
You know what it will do!

The Horsepower and torque for each Sioux drill is rated, stated, and certified. It isn't necessary to buy just a drill. When it's a Sioux you know what it will do. See the power specifications for Sioux Electric Drills in this advertisement.

NEW

Super Powered $\frac{1}{4}$ " and $\frac{3}{8}$ " DRILLS!

Here is super power to provide all the torque necessary for any operation where this type of drill would normally be used. (See specifications) And there's a speed for every need. It's an entirely new design in which the brushes have been located at the fan position at front of the drill. The advantages include cooler running, and easier inspection and replacement of motor brushes without partial or complete disassembly of the tool. Ball and roller bearing construction, with finest precision gears and mechanical design have achieved a new high in output efficiency.



Leading distributors
everywhere display
and sell Certified
SIOUX power drills.
**AUTHORIZED SERVICE
AND DISTRIBUTORS
IN PRINCIPAL CITIES**



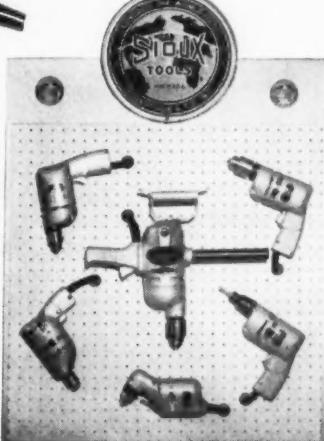
ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U. S. A.

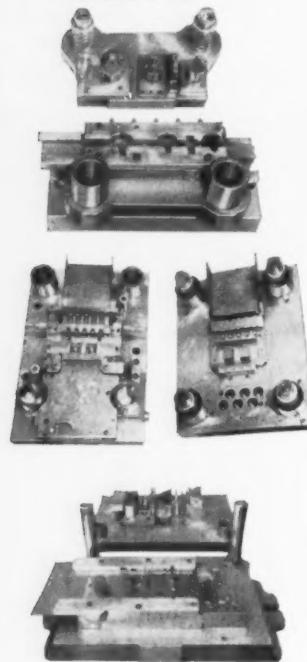
AIR IMPACT WRENCHES • AIR SCREWDRIVERS • "PELICAN" NUT ACCUMULATORS •
ELECTRIC IMPACT WRENCHES • DRILLS • GRINDERS • SANDERS • POLISHERS • VALVE
FACE GRINDING MACHINES • SCREWDRIVERS • PORTABLE SAWS • FLEXIBLE SHAFTS

• ABRASIVE DISCS

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Produced by
LATROBE
for long-run
dies . . .



Metalmasters

Fully-Uniform . . .
Free-Machining
DESEGATIZED®
OLYMPIC FM
High Alloy Die Steel

When your die production calls for long-run service . . . and you need a die steel that yields a superior machine finish without tearing—one that has excellent non-deforming characteristics in heat treatment . . . that's the time to use Latrobe's OLYMPIC FM.

OLYMPIC FM is an air hardening 12% chromium (D-2 type) die steel made to exacting standards by Latrobe Metalmasters . . . guaranteed to be fully-uniform in the distribution of wear-resisting carbide particles and alloy sulphides for better machinability . . . a result of Latrobe's exclusive DESEGATIZED® process of manufacture!

There's a wide range of Olympic FM sizes stocked at branch warehouses near you—Call today!

◆ *Or send for Olympic FM Data Sheet today!*



LATROBE STEEL COMPANY

MAIN OFFICE and PLANT: **LATROBE, PENNSYLVANIA**
 BRANCH OFFICES and WAREHOUSES:

BOSTON • BUFFALO • CHICAGO • CLEVELAND • DAYTON
 DETROIT • HARTFORD • LOS ANGELES • MILWAUKEE
 MIAMI • NEW YORK • PHILADELPHIA • PITTSBURGH
 SAN LEANDRO • TOLEDO

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POPE engineers and builds 20,000

DIFFERENT motorized and Belt Driven
S P I N D L E S

one of which may be just the one to
LOWER YOUR PRODUCTION COST

Here are only a few representative Pope Precision Spindles:



FOR SURFACE GRINDING

POPE 1, 2 and 3 HP Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with double row cylindrical roller bearings of enormous capacity for superior performance and long life, plus separate thrust bearings for no endwise movement of the shaft.



FOR HEAVY DUTY MILLING AND GRINDING

POPE $\frac{1}{2}$ to 100 HP Direct Motorized Spindles operate in any position — flanged or tapered noses — equipped with super-precision, double-row roller bearings and preloaded ball thrust bearings. Top quality performance is assured on skin milling, grinding, boring and other operations as well as milling.

FOR TOOL AND CUTTER GRINDING

POPE Super-Precision 1 HP, 3600 RPM Motorized Tool and Cutter Grinder Clearance Angle Swivelling Heads

provide angular adjustment in a vertical plane. They pay for themselves in time saved. Cup wheels can be used for practically all clearance angles.



FOR BORING ROUND HOLES WITHIN MILLIONTHS OF AN INCH

POPE Heavy Duty Boring Spindles assure smooth, chatter free, continuous high production of accurate parts. Belt driven or motorized, in a wide range of horsepowers and speeds.



FOR INTERNAL GRINDING

POPE Precision Internal Grinding Spindles have the super-precision bearings to withstand both axial and radial loads and to produce better finished ground holes. Their ability to take heavy cuts means increased production. Wheel life is increased, too. For Bryant, Cincinnati, Excello, Heald, Landis and Norton Grinders.

FOR HIGH CYCLE GRINDING AND MILLING

POPE Super-Precision, High Frequency, Heavy Duty Spindles are available for speeds up to 100,000 RPM. They are unequalled for low cost maintenance, long life, trouble-free operation and rugged ability to cut metal fast.



Send us your specifications and get prompt quotations on the one best Spindle for you out of the 20,000 different Precision Spindles that bear the name "POPE."

No. 116

POPE®

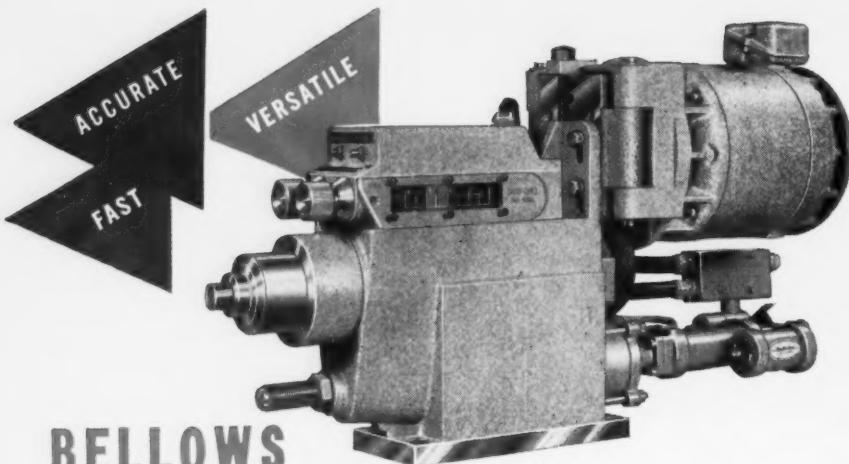
POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

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September, 1959

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BELLOWS "Carbi-Drill" DRILL UNIT

• Runout not over .001" T.I.R. in full 4" stroke.

• Capacity to $\frac{5}{8}$ " drill in mild steel.

• Spindle speeds available from 609 RPM to 6275 RPM.

• Depth Accuracy .003" with standard limit switch; .001" with optional Bellows BT-1 Timed Dwell Control.

The rugged, heavy-duty "Carbi-Drill" is ideal for use in toolroom-built special-purpose machinery for high speed precision drilling, tapping, reaming, counterboring, etc. Extremely versatile, "Carbi-Drill" units can be mounted in any position, are easily synchronized with each other or with other Bellows "Controlled-Air-Power" Devices for fully automatic operation. Air powered rapid advance and retract, hydraulic feed rate adjustable for any tool working in any material.

Free Bulletin CD-17 gives complete information and specifications. Write for your copy today. Address Dept. MMS 959, The Bellows Co., Akron 9, Ohio.

1342 b

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Anderson Co., Cleveland, Ohio

The Bellows Co.
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)
AKRON 9, OHIO

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This is a MARVEL High-Speed-Edge Hack Saw Blade Cutting a 4" x 4" Titanium Billet

**EVERYTHING'S IMPROVED
BUT THE**

GUARANTEE

33 years ago, MARVEL introduced the first welded-edge hack saw blades... guaranteed them to be shatterproof... and a new concept of power hack sawing came into existence.

In combining, by welding, two materials—a narrow, high speed steel cutting edge, and a tough alloy steel body, MARVEL pioneered the modern hack saw blade.

When operators learned they could apply the heaviest feed pressures and highest speeds to the new MARVEL Blades with complete confidence that they would never shatter or "explode" to cause them personal injury, hack sawing began the approach to its present high level of efficiency. Even cutting "exotic" metals, such as titanium, where heavier feed pressures are a necessity, the MARVEL Blade does an outstanding job and is completely safe.

Today's MARVEL High-Speed-Edge Hack Saw Blades are greatly improved, even over the MARVEL Blades which were the best on the market a few years ago. Advanced metallurgy has produced better steels; new heat treating and manufacturing techniques have brought further improvements. The only thing unchanged is the Guarantee: THEY ARE SHATTERPROOF!

If you haven't used MARVEL High-Speed-Edge Hack Saw Blades recently, try them on your saws for a month and see the difference a truly superior blade can mean in higher speeds, greater accuracy, lower cost per cut, and guaranteed safety to operating personnel. Your nearby MARVEL Distributor carries a complete stock of MARVEL High-Speed-Edge Blades.



Write for Bulletin CT-175 which has complete details on MARVEL High-Speed-Edge Hack Saw Blades.

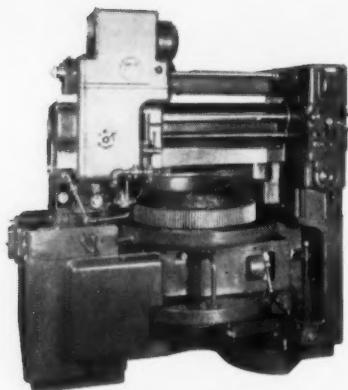
ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

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September, 1959

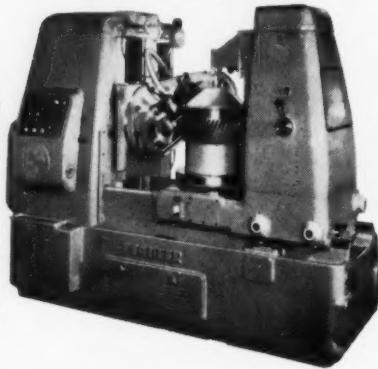
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MARVEL Metal Cutting
SAWS

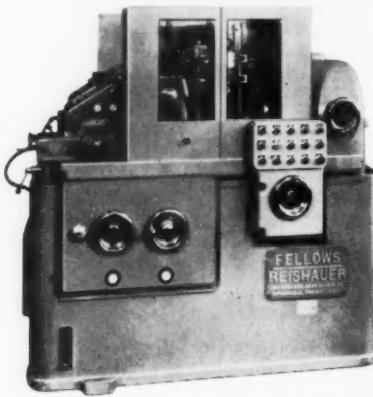


Fellows Gear Shapers...up to 120" capacity

**SHAPE IT, HOB IT,
OR GRIND IT! ONLY
FELLOWS OFFERS
ALL 3 MACHINES!**



Pfaudler Gear Hobbers...up to 120" capacity



No. 12 Fellows-Reishauer Gear Grinder...up to 12" capacity

WHATEVER YOU NEED for modern gear productivity, Fellows has the equipment to keep you in the competition! In addition to Gear Shapers, and all other Fellows equipment from cutters to inspection instruments, Fellows now sells the No. 12 Fellows-Reishauer Gear Grinding Machine and the complete line of world-famous Pfauser Gear Hobbers! Fellows Gear Shapers and Pfauser Gear Hobbers provide outstanding accuracy and high production speeds, on short runs as well as long runs, for a wide range of gears up to 120" P.D. On all but the larger units, a wide range of attachments is available for semi-automatic or fully automatic operation. Runout tolerances measured in tenths, produced at production line speeds, are the special province of the No. 12 Fellows-Reishauer Gear Grinding Machine. Simple, fast set-up permits economical grinding of single gears as well as long runs in sizes up to 12" O.D. Ask your Fellows Representative about the complete line of gear production and inspection equipment. Just write or call any office of The Fellows Gear Shaper Company, 78 River Street, Springfield, Vermont. Branch Offices: 1048 N. Woodward Ave., Royal Oak, Michigan; 150 W. Pleasant Ave., Maywood, New Jersey; 5835 W. North Ave., Chicago 39, Illinois; 6214 W. Manchester Ave., Los Angeles 45, California.

FELLOWS GEAR PRODUCTION EQUIPMENT

THE PRECISION LINE

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Specify Ex-Cell-O standard power units and cut your machine tool lead time

Today's demand for increased productivity, lower per-unit cost, even on relatively short runs, is being met economically by automatic, single-purpose, high-production machines—consisting essentially of a plain base and one or more Ex-Cell-O Quill-Type Hydraulic Power Units.

These standard, self-contained Ex-Cell-O Hydraulic Power Units are now being

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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used for: drilling, counterboring, spot facing, reaming, as well as prime movers for milling equipment. Multiple operations may also be performed.

For the full story on the cost-saving advantages get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

*Style 22—8-inch Stroke; Style 22-L—12-inch Stroke.

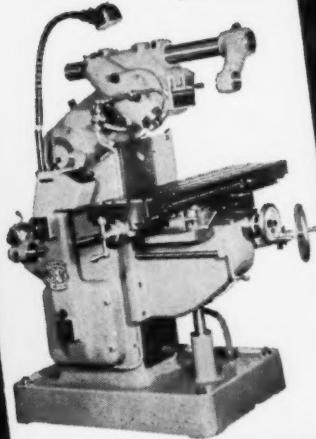
58-21R

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN
*Machinery
Division*

Exceptional Values! Available from stock!

PRECISION MILLING MACHINES

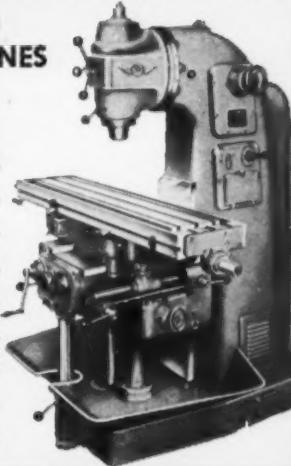
ABENE
VERTICAL HORIZONTAL
MILLING MACHINE
\$3990.



THOUSANDS SOLD TO SATISFIED CUSTOMERS!

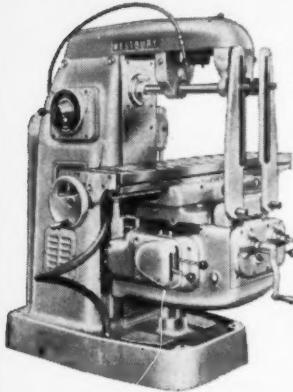
PEDERSEN HORIZONTAL, VERTICAL and combination MILLING MACHINES

Model	Table Size in Inches	Base Price
VPF-00	35½ x 8½	\$1663.
VPV-00	35½ x 8½	\$2463.
VPU-0	39½ x 9½	\$2890.
VPU-1	51 x 12	\$3260.
VPV-1	51 x 12	\$3760.
VPF-2	61 x 12	\$6185.
VPU-2	61 x 2	\$6285.
VPV-2	61 x 12	\$6885.
VPF-4	75 x 16	\$12850.



LIBERAL TERMS • RENTALS

WESTBURY Universal Dial-Type Horizontal Milling Machines



Model	Table Size in inches	Base Price
1U	40 x 10	\$3390.
2U	51½ x 10½	\$5265.
3U	60 x 12½	\$6275.
1-S	42 x 9	\$1690.
Contour	42 x 9	\$3190.

AGENTS WANTED

WESTBURY

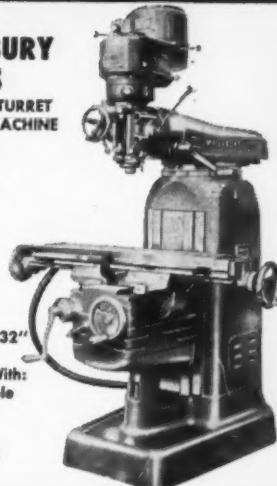
I-S

VERTICAL TURRET
MILLING MACHINE

\$1595

Incl. Motor
& Controls

1½ H.P. 9" x 32"
Table
Available With:
9" x 42" Table
\$95. extra
Coolant
\$155. extra



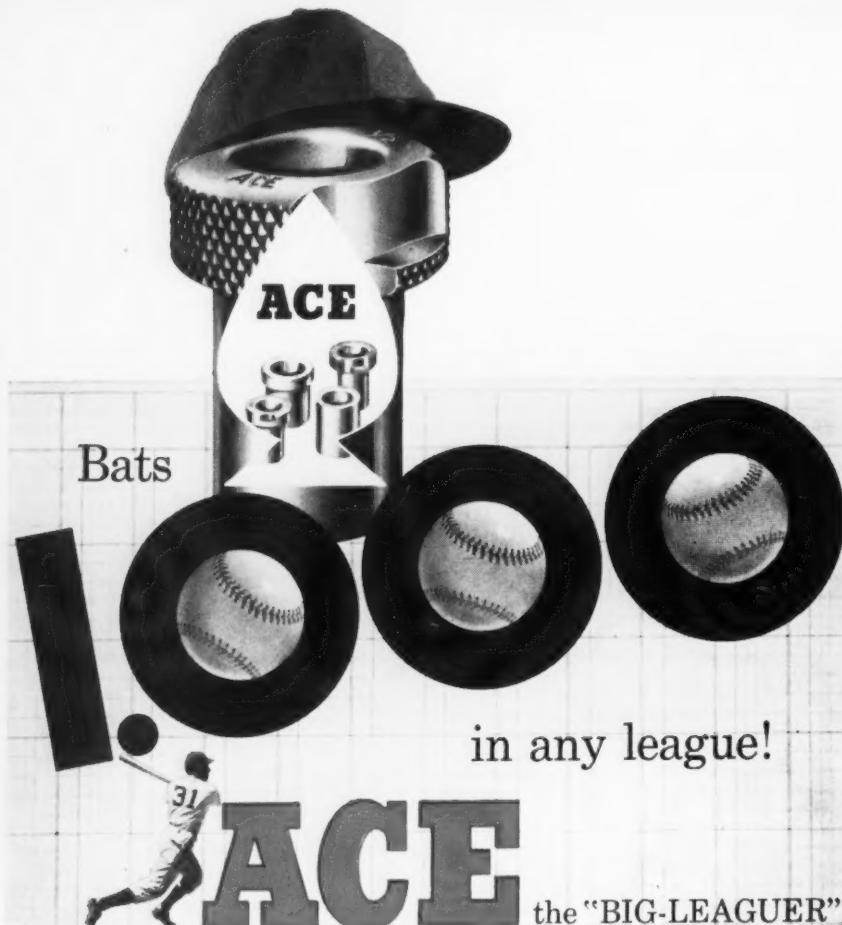
AARON MACHINERY CO., Inc.

DEPT. M 45 CROSBY ST., N. Y. 12 • WA 5-8300

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BRANCHES AT:
BUFFALO, N. Y. RICHMOND, CAL.
MINEOLA, N. Y. LOS ANGELES, CAL.
HOUSTON, TEXAS

SEE OTHER AD ON PAGE 18



in DRILL BUSHINGS!

QUALITY

ACCURACY

LARGEST DELIVERABLE STOCKS ANYWHERE

STOCKED, FOR IMMEDIATE DELIVERY BY LEADING TOOL SUPPLIERS IN YOUR COMMUNITY.

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MICHIGAN
10670 West Nine Mile Road
DETROIT 37 - Lincoln 8-0777

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Danny DoALL says:

"For Complete SERVICING of

Demon[®] SAW BANDS

HIGH-SPEED STEEL



Call your local
DoALL STORE!"

Experts specialize in
guaranteeing new life
for your usable Demon
bands by reconditioning,
resharpening and
inspection . . . and their
weld perfection assures
3½ times longer flex life.
Also complete stocks of
new blades.



IN STOCK
AT YOUR LOCAL DoALL STORE

THE DoALL COMPANY
DES PLAINES, ILLINOIS

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WHY BUY METAL YOU DON'T USE?

Switch to

Allegheny Ludlum Cast-to-Shape Tools



FORGED DISC

Forged disc necessary for fabricating welded tube mill roll.



**CAST-TO-SHAPE
TOOL STEEL**

Cast-to-shape welded tube mill roll. 220 lbs. lighter than forging. \$780 cheaper for finished shape.

\$780 Saved by changing to Cast-to-Shape

Why pay for metal that ends up chips on your floor? Here are two pertinent reasons why you should stop hogging your complex tools from blocks of metal and let Allegheny Ludlum cast them to shape.

**CAST-TO-SHAPE MEANS
YOU BUY FEWER POUNDS OF METAL.**

For example, the roll shown above is 220 pounds lighter in the rough state than its forging cousin. Allegheny Ludlum cast-to-shape tools are more economical than tool steel forgings, and just as strong in certain applications.

**CAST-TO-SHAPE MEANS
LESS FINISH MACHINING.**

This is especially important with a complex shape. For instance, the casting above has only $\frac{1}{4}$ to $\frac{3}{8}$ inches of machine stock on its surfaces, requiring only one roughing and one finishing operation. Estimated savings by using an Allegheny Ludlum cast-to-shape tool amount to \$780.

Allegheny Ludlum, a tool steel producer who makes cast-to-shape tools, casts them with the same precise quality control for which their tool steels is known. A full line of cast-to-shape tool steel grades is available. You'll find ones with high resistance to abrasion, compressive strengths of approximately 400,000 psi, easy machinability, hardening with almost no distortion, toughness, high red hardness, and the capacity to take a high polish.

Find out now how you can cut costs on your complex tools. Write for FC-4, a 28-page technical discussion of A-L's Forging and Casting Division with applications, pattern information, design tips, analyses, and heat treating instructions. Or call your nearest A-L tool steel warehouse or distributor.

**ALLEGHENY LUDLUM STEEL CORPORATION,
OLIVER BUILDING, PITTSBURGH 22, PENNA.**
Write to Dept. MS-21.

7871

ALLEGHENY LUDLUM

Tool Steel Warehouse stocks throughout the country . . . Check the yellow pages

EVERY GRADE OF TOOL STEEL . . . EVERY HELP IN USING IT

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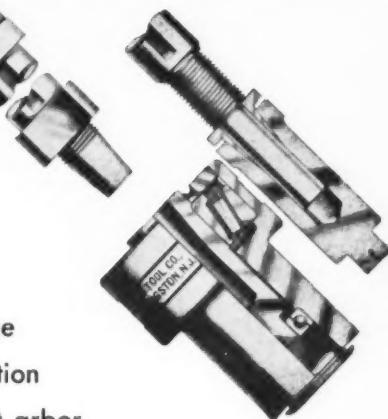


**NOW, no more part-time milling machine with
with**

J & S NO-BEND

**hardened & ground
detachable**

**Milling machine ARBORS,
ADAPTERS and
live bearing supports**



**Full-time tooth
engagement, plus all
these features:**

Interchangeable to 40 or 50

taper machines • quick change

- lower cost • more production
- longer cutter life • correct arbor length • tool adapters • high speed rugged live bearing support.

Write for free literature and price list.

WHEEL DRESSERS



JAW CLAMPS • PRECISION VISES • DOWN HOLDING DEVICES

J & S TOOL CO., INC.

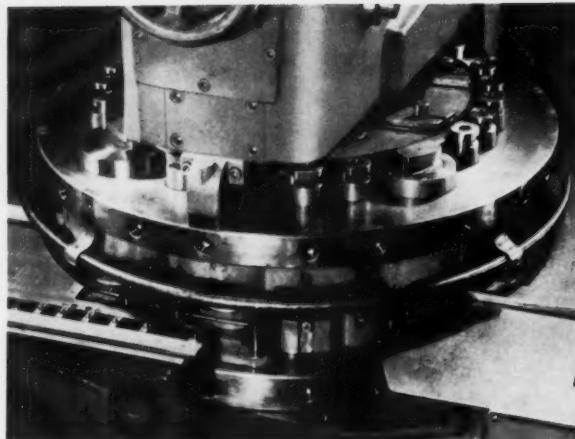
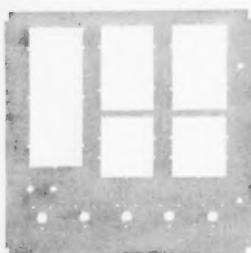
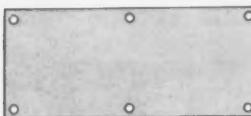
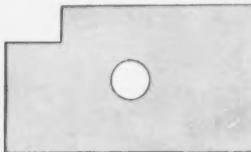
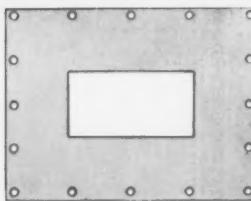
CLAMPCUT

871 DORSA AVE.
LIVINGSTON, NEW JERSEY

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September, 1959

modern machine shop 33



You're Always Set-Up with a WIEDEMANN

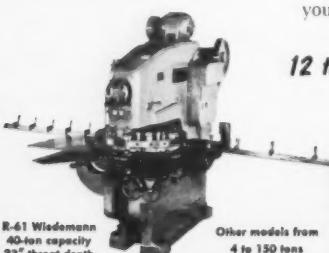
. . . and ready to locate and pierce openings in low quantity work. Many different jobs can be produced in as little as one minute total time each, as compared with the 15 to 30 minutes or more for setup alone required by other methods.

Work is accurately positioned with a quick setting mechanical gauge and holes of any size or shape are pierced in rapid sequence. From 12 to 32 different punches and dies are in the turrets ready for use. Only one punch and die of a size is required. Layout, costly die sets and multiple tool setups are completely eliminated.

The Wiedemann Method is the positive way to combat increasing production costs. Direct savings of 60% to 90% are commonplace—all the way from engineering to assembly.

Learn how these savings can be yours. Send drawings of your work for time study, and write for Bulletin 301.

12 to 32 Punches and Dies Ready for Use



R-61 Wiedemann
40-ton capacity
33" throat depth

Other models from
4 to 150 tons

WIEDEMANN
MACHINE COMPANY
TURRET PUNCH PRESSES

DEPT. MM-9 • GULPH ROAD • KING OF PRUSSIA, PA.

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MOLYKOTE®

L U B R I C A N T

metalworking

news

PUNCH LIFE INCREASED
FROM 2,000 to 25,000
HOLES IN STEEL PLATE



These punches (11/16") were used to punch 25,000 holes in 1/4" 1020 cold rolled steel plate. Without MOLYKOTE Lubricant a maximum life of only 2000 holes could be obtained.

A West Coast manufacturer was experiencing low punch life with the best conventional lubricants. Their multiple punching operation consisted of cold shearing 50 holes simultaneously in a single steel plate. A maximum life of 2,000 holes per punch was obtained with ordinary lubricants.

Then, MOLYKOTE Type G was applied to the punch occasionally. The result: punch life was increased from 2,000 to 25,000 holes which afforded substantial savings.

When writing, refer to Item 508

"A LITTLE BOTTLE FOR A BIG JOB"



- For Extending Die Life.
- For Preventing Metal Pickup.

Try it . . . Order a 10 ounce container of MOLYKOTE Type Z TODAY!

When writing,
refer to Item 507

MOLYKOTE CANNOT BE SQUEEZED OUT REGARDLESS OF PRESSURES; EXCELS AS COLD-FORMING LUBRICANT IN METALWORKING

Distortion, Stick-Slip and Fretting Eliminated • Mounting Loads Reduced • Chatter and Noise Avoided • Allows Easier Disassembly

In metal forming the most difficult problem to overcome is scuffing from metal pickup on the dies. Direct contact of bare surfaces of a piece undergoing formation with the die often results in galling, scuffing, etc. If the surfaces can be separated by a lubricant of sufficient film strength, metal pickup does not occur.

Before new dies are used, burnish them with MOLYKOTE Type Z. If the lubricant you are now using does not have sufficient film strength and galling does occur, use MOLYKOTE on your dies.

The automobile industry which forms and fabricates vast tonnages of various metals, uses MOLYKOTE Type Z extensively.

When writing, refer to Item 505

DAMAGE DUE TO IMPROPER MACHINERY "WEAR-IN" CAN BE ELIMINATED WITH NEW COMPOUND

Wear-in damage is often serious enough to require costly reconditioning of new equipment and if the damage is not repaired, it will interfere with and reduce the useful service life of expensive machinery. During this critical wear-in period, damage due to galling, scoring, tearing, scratching, excessive abrasion and seizing is an inherent hazard. MOLYKOTE WEAR-IN COMPOUND is the most effective lubricant yet developed to combat this damage.

In seven different ways, MOLYKOTE WEAR-IN COMPOUND saves you time and money:

1. Shortens "wear-in" period without use of abrasives.
2. Reduces galling, seizing and excessive wear during the critical "wear-in" period in new or rebuilt machinery and after the installation of replacement parts.
3. Offers the best safeguard against costly reconditioning work and shipping delays due to the "breaking-in" of new machinery.
4. Eliminates "stick-slip" behavior and resists galling and seizing at bearing



Applying MOLYKOTE Lubricant to feed stock at The Bassick Company, Bridgeport, Conn., in a forming operation.

pressures far beyond the yield point of any metal.

5. Specifically designed for "wear-in" use. MoS_2 particles make intimate contact with bearing surfaces. Will not scrape off.
6. Need not be burnished into surface. Brush or wipe on a thin coating.
7. Inexpensive . . . a little goes a long way.

When writing, refer to Item 506

Address your letter to The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.
Phone: Fireside 8-3724.

THE ALPHA-MOLYKOTE CORP.

Stamford, Connecticut

Please send me details on

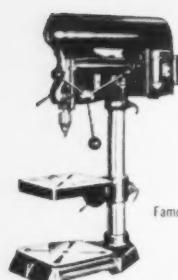
Item 505 <input type="checkbox"/>	Item 507 <input type="checkbox"/>
Item 506 <input type="checkbox"/>	Item 508 <input type="checkbox"/>
Name _____	Company _____
Address _____	Address _____
City _____	City _____
State _____	State _____

SEE OUR
CATALOG IN
SWEET'S
A TRADE SHOW CATALOG

THE ALPHA-MOLYKOTE CORPORATION

BREAKING LUBRICATION BARRIERS

... THROUGH RESEARCH



Famco



Walker-Turner



Buffalo Forge



Taylor



Duro

DRILL PRESS MANUFACTURERS

put their money on



Sprunger



Delta



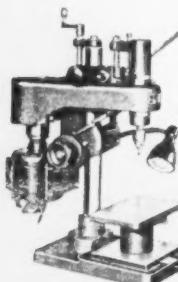
Powermatic



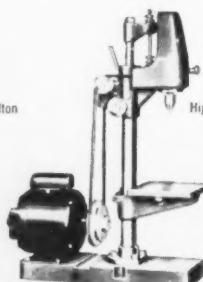
South Bend



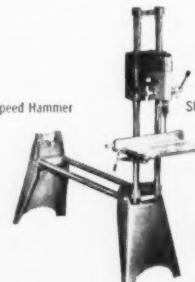
Sears' Craftsman



Hamilton



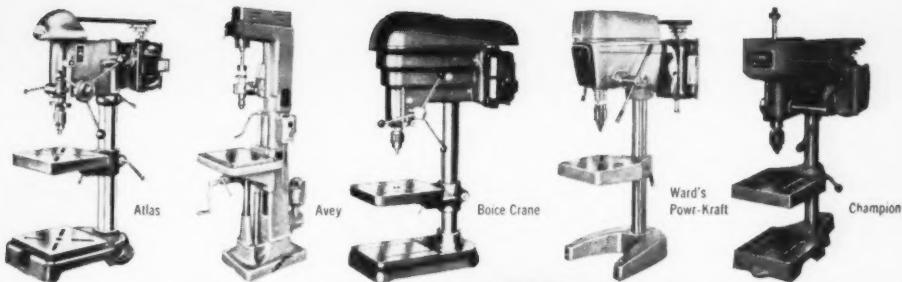
High Speed Hammer



Shop Smith



Sigourney



Jacobs CHUCKS



Darra James



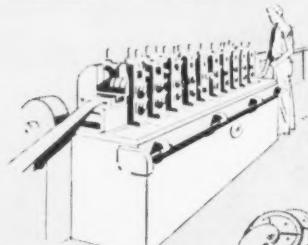
A PARTNERSHIP IN PROGRESS

Your industrial supply distributor makes it his business to know your business. He is always available and ready to fill your needs quickly, dependably and economically. When you need chucks, you can depend upon Jacobs and the Jacobs industrial supply distributor who works with you . . . your partner in progress through service.

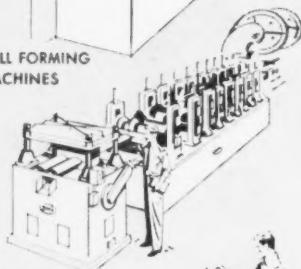


THE JACOBS MANUFACTURING COMPANY, WEST HARTFORD, CONNECTICUT
For more data circle 339 on Postpaid Card

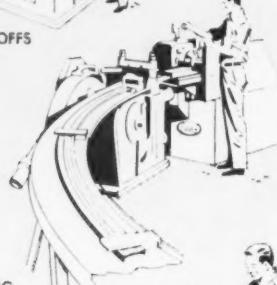
HEAVY DUTY
ROLL FORMING EQUIPMENT



ROLL FORMING
MACHINES



CUT-OFFS



CURVING
ATTACHMENTS



COILING
EQUIPMENT

YODER COLD ROLL-FORMING EQUIPMENT

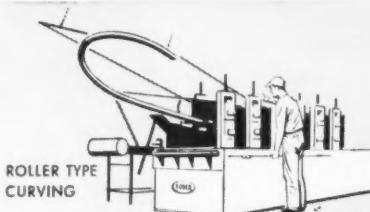
for profitable mass production

High speed, YODER Cold Roll-Forming machines are the most economical method for mass producing structural or ornamental shapes. One machine with one operator can form up to 40,000 feet of shapes per day. Even on a part-time basis, a YODER Cold Roll-Forming machine can prove to be a profitable investment.

YODER flexibility works for you too, curving, coiling, ring forming, multiple roll-forming and embossing—on a wide variety of metals—can be incorporated into your production line. Practical, YODER-engineered design minimizes maintenance and downtime... assures uniformity, accuracy and reliability of your end product.

In addition to Roll-Forming machinery, YODER also makes a full line of Rotary Slitting equipment, Pipe and Tube mills. Send for the fully descriptive Cold Roll-Forming Book.

THE YODER COMPANY
5532 Walworth Ave. • Cleveland 2, Ohio



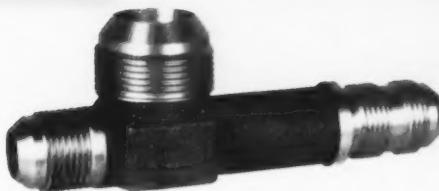
COLD ROLL FORMING MACHINES

PIPE AND TUBE MILLS (ferrous or non-ferrous)

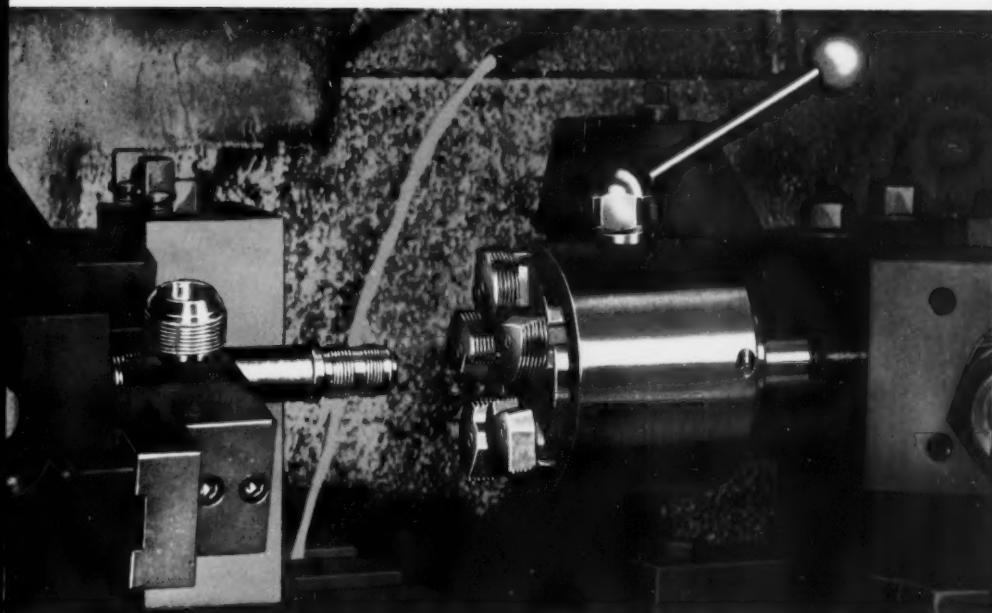
ROTARY SLITTING LINES

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When Threading Specs
Read **A.Q.R.**...



Parker standardizes on 5 Chaser Vers-O-Tools



1½—12 and 1¾—12 threads cut on this 316 stainless steel forging. A 30 microinch finish is maintained.

*"Additional Quality Required" are by-words for this leading manufacturer of precision fittings. The rigid specifications for critical missile components produced in their Cleveland, Ohio plant demand *better than aircraft quality*. "That's why we use Namco Vers-O-Tools almost exclusively," says D. S. Manning, Manager, Parker Fittings & Hose Division, Parker-Hannifin Corporation. "These automatic 5 chaser die-heads eliminate lead error, taper and grooves on the thread flank . . . with overall thread quality at least 50% better than 4 chaser heads. The result is precision fittings with true seating surfaces and a perfect gauge fit."

Prove these facts for yourself: more pieces per grind; precision threading of parts with undercuts, flats, slots; unsurpassed economies in chaser grind-

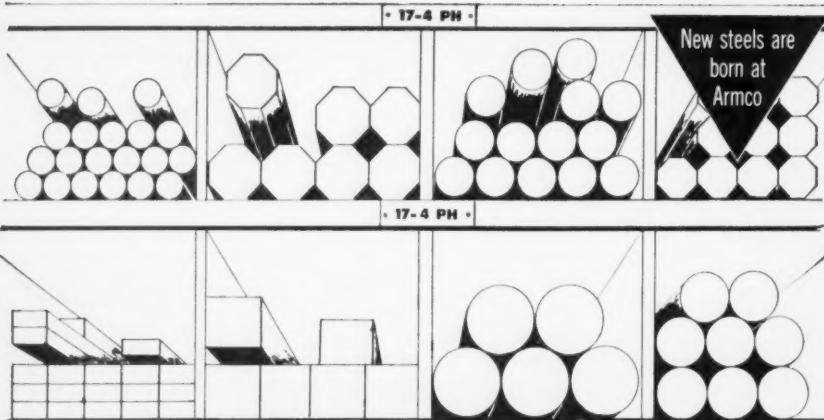
ing and precise relocation of chasers without readjustment . . . and a complete range of sizes. Namco 5 chaser Vers-O-Tools are only a part of a complete line of threading tools designed to provide the tolerances and finish required for *your* toughest jobs. Write for complete information.

**National
Acme**

The National
Acme Company
183 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N. J.;
Chicago 6, Ill.; Detroit 27, Mich.

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Many Distributors Now Stock Armco 17-4 PH Stainless Steel

New applications for Armco 17-4 PH Stainless Steel have developed so fast that many Armco Distributors around the country are stocking this special precipitation hardening grade in a variety of sizes for immediate delivery.

There are two reasons for the popularity of Armco 17-4 PH. It has unique fabricating characteristics and exceptional mechanical properties when fully hardened. This special steel can

be finish-machined in a soft condition, then brought to full hardness (Rockwell C 44) with a single low-temperature (900 F) heat treatment.

For complete information on Armco 17-4 PH Stainless Steel, just call your nearby Armco Distributor. Write us for his name if you aren't already acquainted with him. Armco Steel Corporation, 1729 Curtis Street, Middletown, Ohio.

ARMCO STEEL



Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

For more data circle 342 on Postpaid Card

**NOW THE WORLD'S GREATEST
VALUE IN A COPYING LATHE.
THE CLEARING-HARRISON**

Just \$3750.00*



Base Price F.O.B. Chicago,
Los Angeles, New York.

*11" copying model—\$3,750.00[†]
Standard 11" model—\$1,950.00[†]

Here are copying lathes at prices you would normally expect to pay for a standard machine! Yet the Clearing-Harrison is a world beater of a lathe—carefully designed and as rugged as they come.

Check These Features!

Standard Duty—Copying mechanism doesn't interfere with the use of the lathe for standard operations.

Induction Hardened Bed Ways—Ways are hardened and ground by Delapena equipment—virtually exclusive with the Clearing-Harrison

Precision Hobbed and hardened gears

Anti-Friction Bearings to the Spindle

Gap Type Bed—Removable block in bed greatly increases maximum swing

FIND OUT MORE ABOUT THE COPYING LATHE YOU CAN OWN FOR WHAT YOU'D EXPECT TO PAY FOR A STANDARD MACHINE.
WRITE CLEARING TODAY!

Clearing, division of U. S. Industries, Inc. also manufactures the Clearing-Axelson line of engine lathes, power presses of all types, dies and special tooling and special equipment for the aircraft and missiles industry.

Write for Clearing Harrison catalog



11" Copying model—\$4,850.00[†]

11" Standard model—\$3,950.00[†]



18" Copying model—
\$6,350.00[†]

18" Standard model—\$4,400.00[†]

Coast to Coast Service Facilities

Clearing's nationwide facilities assure you of prompt service always. Replacement parts and accessories are stocked at Clearing and are available through all three plants, at all service centers and through all Clearing dealers.



DIVISION OF U. S. INDUSTRIES, INC.

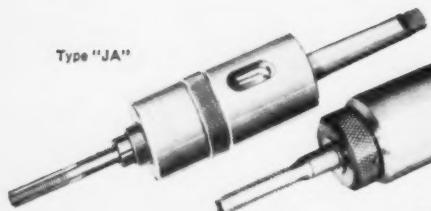
6499 W. 65th Street • Chicago 38, Illinois

Plants in: Chicago, Ill. • Hamilton, Ohio • Los Angeles, Calif.

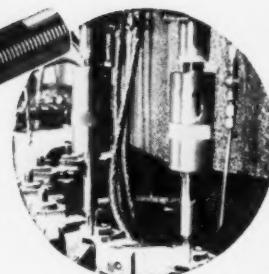
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usi **Clearing**

Type "JA"



Type "JT"—
with lock-and-eject
collet, speeds tool changes



let taps or reamers float free

In reaming or tapping the true solution to the problem of misalignment lies in the use of a "free" floating holder. Unrestricted float is necessary to avoid elliptical holes in reaming and tapered threads in tapping.

Only Scully-Jones floating holders have a double-gear spline drive coupling which provides the required tool movement . . . allows "free" float in all directions. Index errors, machine wear, manufacturing tolerance and heat distortion cannot affect accuracy or finish. "Binding" and "cramp-

ing" associated with wobble-type holders are eliminated. So are rejects and tool breakage. There is a size and style for every requirement, including close center work, presetting, quick tool change, horizontal or vertical machining.

Ask your Scully-Jones representative or distributor for Bulletin 8-50. Find him in the yellow pages of your local directory, or call us direct: Bishop 7-5900.

Scully-Jones and Company
1809 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

**AUTOMATIC
RECESSING
TOOLS**



**SCULLY
JONES**

**FLOATING
HOLDERS**

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*Feature for feature,
Price* for price...*

**CHECK LIST
FOR DRILLING AT A
PROFIT**

SPINDLE ACCURACY
Bearings at TOP and
bottom of spindle
pulley.

BUILT-IN ELECTRICS
with overload
protection.

**POSITIVE
DEPTH GAGE**
Quickly set for
positive stop.

RAPID SPEED CHANGE
Five spindle speeds.

SPACIOUS TABLES
Unusually wide
work range.

APPEARANCE
Streamlined
functionally.

ACCESSORIES
Profit-boosting
attachments and
accessories.

this
CINCINNATI 16" ROYAL DRILL
is your **BEST DRILLING BUY!**

This is a real metalworking drill — a multi-purpose machine tool built to handle light drilling on a production basis, and for utility operations. "CINCINNATI-quality" means that it holds its accuracy longer, stays on the job longer.

ROYALS are built in 16" and 18" bench and floor types, single and multiple spindle.

Only \$128 for the Cincinnati 16" Royal bench type drill shown. Complete with 0"- $1\frac{1}{2}$ " chuck or #2 M.T. spindle, built-in single phase manual control with overload protection—less motor. Floor model, as above, only \$143.

See your CL&T Dealer, or write us direct.



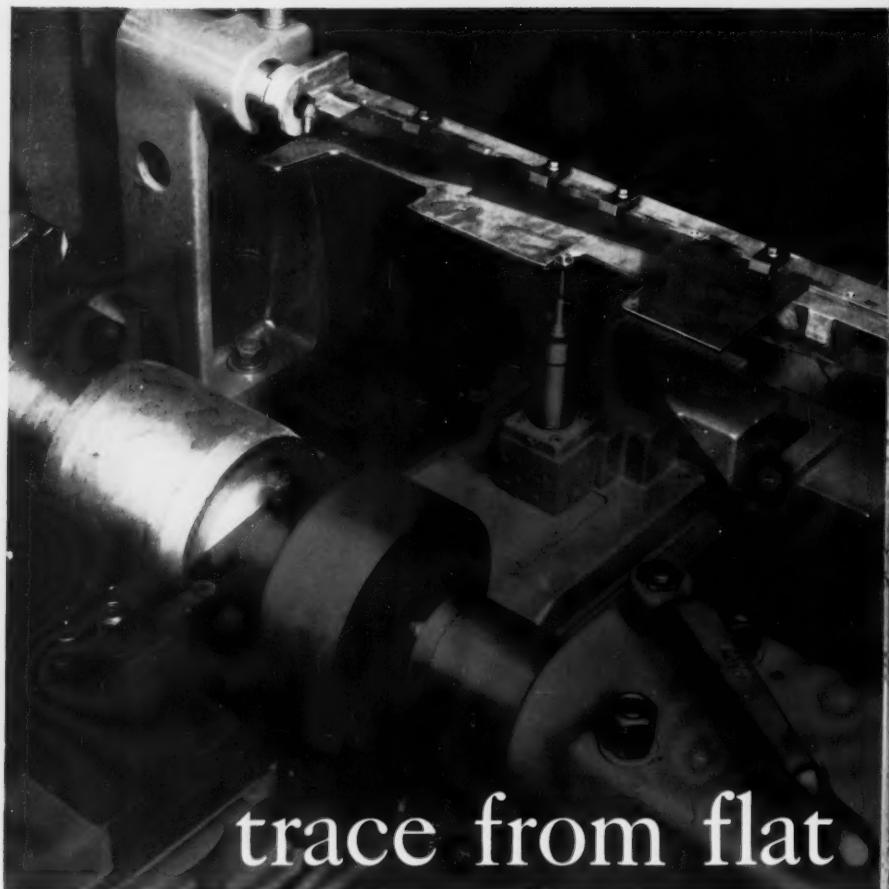
Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners

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trace from flat with LeBlond's new

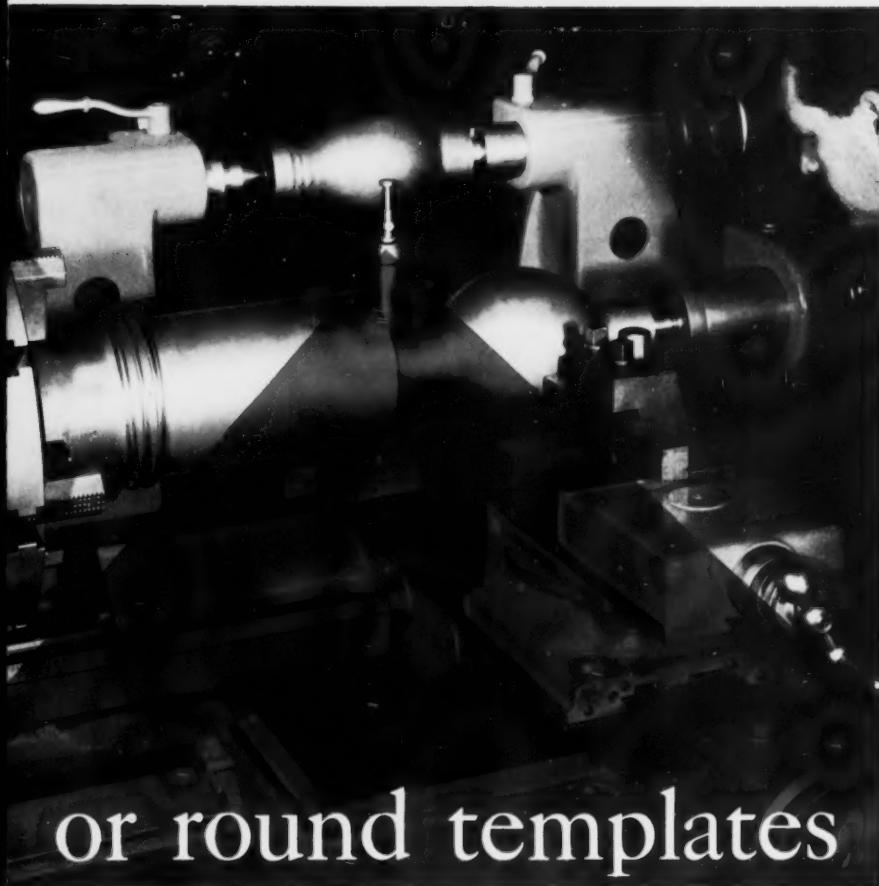
*available on 13", 16", 20", 25"
and 32" Heavy Duty Lathes
16", 20", 25", 32" and 40"
Standard Duty Lathes*

EXCLUSIVE ADVANTAGES

No loss of swing capacity (raises unnecessary). Tracer system allows full horsepower at tool.

All hydraulic controls conveniently located at apron—change from trace to conventional simply by adjusting two nuts at apron.

No overarms or other obstructions to loading templates—



or round templates

90° Tracer

all components, including hydraulic pump and tank, integral with cross slide.

Positive mechanical linkage between stylus and tool slide — no strain on cross feed screw and nut.

Tolerance — .001" on diameter; .001" on shoulder length.

Write today for descriptive bulletin.

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September, 1959

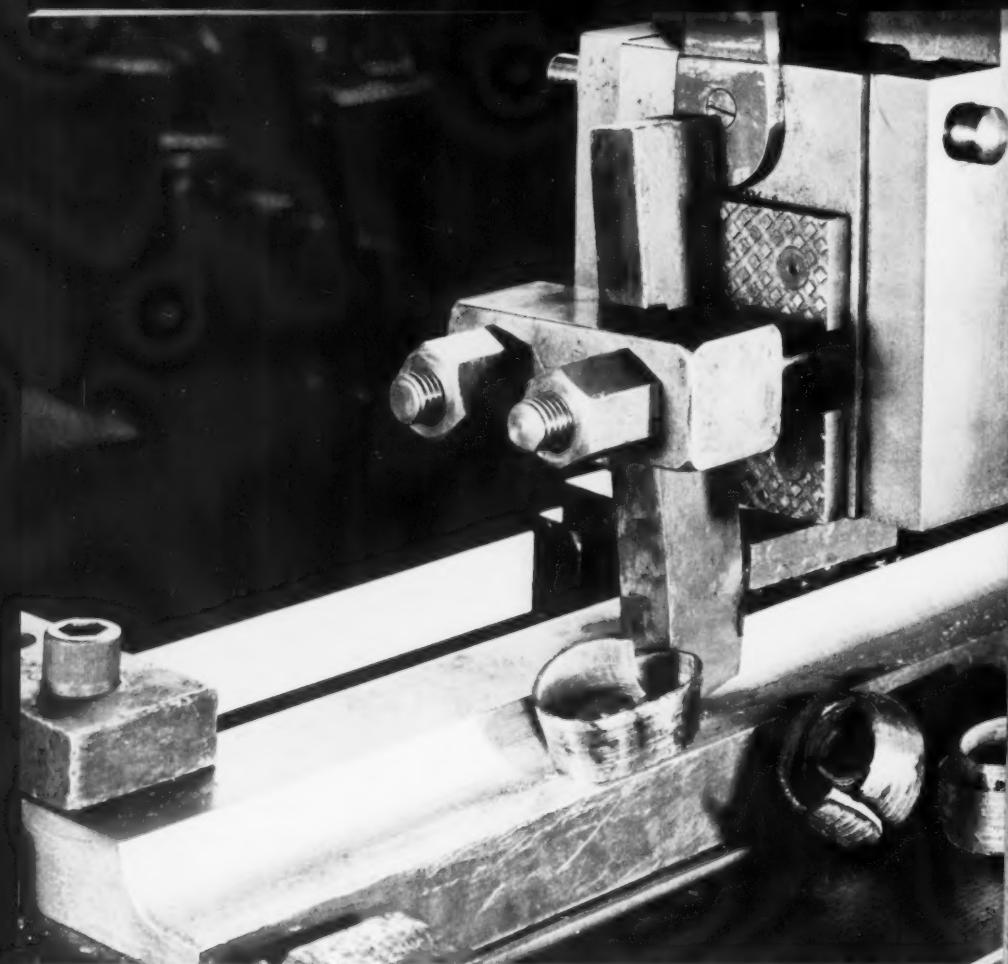
modern machine shop 45

... cut with confidence

THE R. K. LEBLOND
MACHINE TOOL
COMPANY,
Cincinnati 8, Ohio



*World's Largest Builder
of A Complete Line of Lathes.*



Machining gib for heavy duty lathe from cold rolled steel. Depth of cut: $\frac{3}{4}$ "; feed: .060"

The Big Cut without the Big Cost

You can pay more, but you can't buy greater power and accuracy than a reliable Smith & Mills Shaper offers. Even if you spend thousands of dollars more, you will not obtain all the advantages of Smith & Mills.

In continuous high speed operation, using heavy feeds and maximum power, a Smith & Mills Shaper holds limits and resists deflection. Reasons are apparent . . . Solid Ram, unequalled for heavy duty, high production work . . . Patented Self-Locking Ram Adjustment for one-step positioning

(even when reciprocating) and complete back-lash elimination . . . exclusive "Solid Unit" Bull Gear Assembly . . . ram, rocker arm, bull gear and other critical components of nodular iron.

Compare . . . feature for feature . . . cut for cut . . . cost for cost! Prove to yourself that a Smith & Mills Shaper offers all the power, accuracy and versatility of the expensive shapers, yet costs hundreds, even thousands of dollars less. Write today for details and specifications.

SMITH & MILLS
SHAPERS

Division of **NEBEL**
Machine Tool Corporation

3409 Central Parkway, Cincinnati 25, Ohio

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POSITIVE DUPLICATION—EVERY TIME!



Each of these gyroscopes positively duplicates the built-in balancing action of every other gyroscope.



And *balance built-in* is an important advantage you get with the toolroom cup wheels shown above, and with *all* CINCINNATI  GRINDING WHEELS. They are manufactured by a remarkable process that gives Positive Duplication, time after time after time.

 With every step of manufacturing rigidly controlled, this unique  process produces wheels of unsurpassed uniformity. One important result: balanced action for a safer job . . . a better job.

When you reorder a CINCINNATI  WHEEL, it will act and grind exactly like the original, helping you maintain production, saving time and money. Whatever shape, grade and size

 you specify . . . centertype, centerless, internal, surface, toolroom or snagging wheel . . . you get Positive Duplication — every time!

 Our factory representatives are trained specialists, experienced in grinding job set-ups and operations. For their help on those extra-tough grinding problems, call your CINCINNATI  GRINDING WHEEL distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.



POSITIVE DUPLICATION

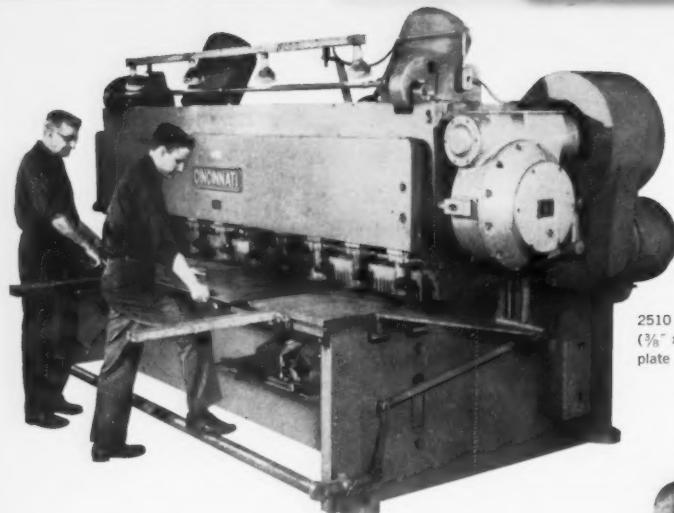
CINCINNATI
GRINDING WHEELS

A PRODUCTION PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

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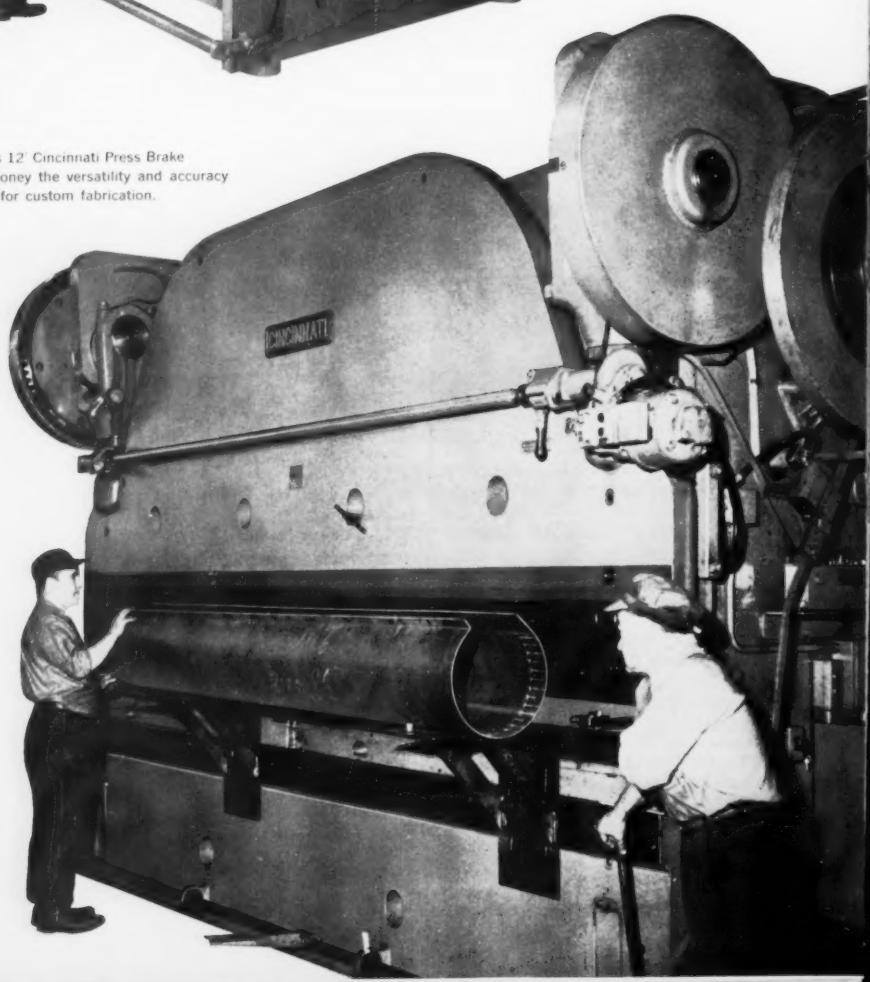
September, 1959

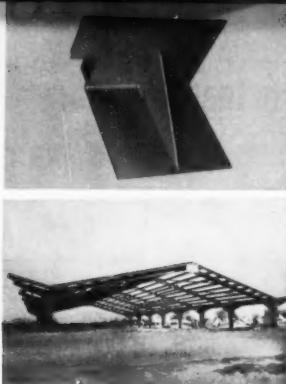
modern machine shop 47



2510 Series Cincinnati Shear
($\frac{3}{8}$ " x 10' capacity) cuts steel
plate with consistent accuracy.

13 Series 12 Cincinnati Press Brake
gives Mooney the versatility and accuracy
required for custom fabrication.





"From brackets to buildings,"
Mooney Iron Works Co. fabricates steel
products on maintenance-free
Cincinnati Press Brake and Shear.

"Not a penny's worth of maintenance since 1953!"

"We haven't spent a penny on maintenance of our Cincinnati® Press Brake and Shear since we got them in 1953," says John L. Mooney, President of Mooney Iron Works Co., Cleveland.

Yet these two machines have been worked hard, day after day, in Mooney's fabrication of structural steel products which range "from brackets to buildings."

By keeping costs down, this extra-rugged Cincinnati stamina helps Mooney compete aggressively and get new business. You can earn these same profits; put Cincinnati Press Brakes and Shears to work in your shop.

Write Dept. G for Bulletin CS-4, which covers all Cincinnati equipment.

Shapers / Shears / Press Brakes



Cincinnati 11, Ohio, U.S.A.

THE **CINCINNATI**
SHAPER co.

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GRINDING METHODS

**Mattison surface grinders
outproduce cutter-type machining
on parts like these**



Stop Lever Bracket

MILL

58 min

GRIND

44 min



Table Guide

MILL

12 min

GRIND

4½ min



Roll Housing

MILL

16 min

GRIND

11 min



Motor Base Plate

PLAIN

82 min

GRIND

57 min



Lock Bar

MILL & GRIND

44 min

GRIND

24 min



Feed Control Plate

MILL & GRIND

35 min

GRIND

20 min



Table Guide

MILL

16 min

GRIND

9 min



Roll Housing

MILL

17 min

GRIND

11 min

CONTINUOUS CUTTING ACTION SAVES MONEY

These jobs show how high-powered surface grinders speed stock removal (up to $\frac{1}{4}$ in. per side is economical) ... with improvements in finish and accuracy. Real savings come from reduction or elimination of scrap, downtime for tool changing and sharpening, setup time, fixture costs, and tool breakage. Ask for a test grind of your parts in our Methods Lab.

MATTISON MACHINE WORKS
Rockford, Illinois Phone WOODLAND 2-5521

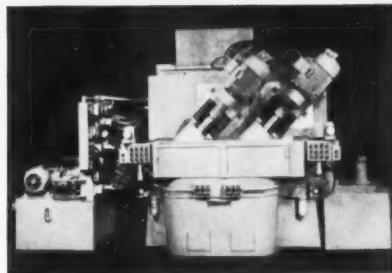
**HIGH-POWERED
PRECISION
SURFACE GRINDERS**



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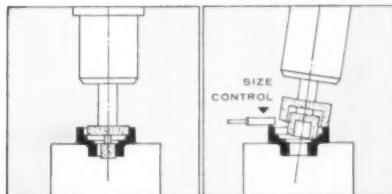
Vertical grinding reduces setups

SPRINGFIELD



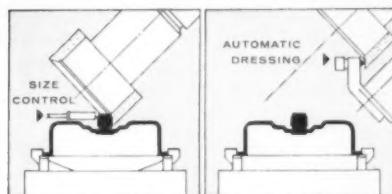
One head grinds while the other retracts for dressing, unloading and loading.

The double spindle Springfield vertical grinder in the photo is typical of vertical grinders automotive production men are using to 1) reduce setups, 2) improve grinding productivity, and 3) save floor space.



Transmission sun gear, 4 surfaces ground in 2 operations.

Two double spindle vertical grinders grind 330 gears per hour. Size control and wheel dressing are accomplished automatically. Typical machine cycle shown below.



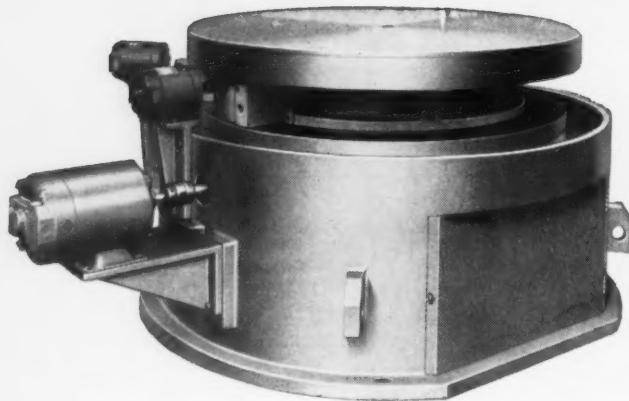
Transmission housing hub, 1.-form grinding with automatic size control; 2. spindle retracted for automatic dressing while operator unloads machine.

When part requirements change, only dresser, fixtures and sizing devices change—the machine itself has a long production life because heads can be repositioned easily.

Springfield special vertical grinders, with any desired degree of automation, pay for themselves in two years or less on long runs; standard Springfield vertical grinders pay off rapidly in large toolrooms and job shops.

We'd like to discuss with you the principle of vertical grinding, vertical contour grinding, and subsequent cost savings. Please send today for illustrated Bulletin 197-B, The Springfield Machine Tool Company, Springfield, O.

For more data circle 351 on Postpaid Card



drill varied hole patterns without changing set-up

If your drilling, tapping, or milling jobs require even, uneven, or skip indexing, this new Electrodex table will give you more flexibility than ever.

Set up your work piece just once on this table, and you can drill many different hole patterns. Changeover from one index pattern to another is fast. You can do it mechanically—with index rings or inexpensive templates—

or by push-button electrical counting.

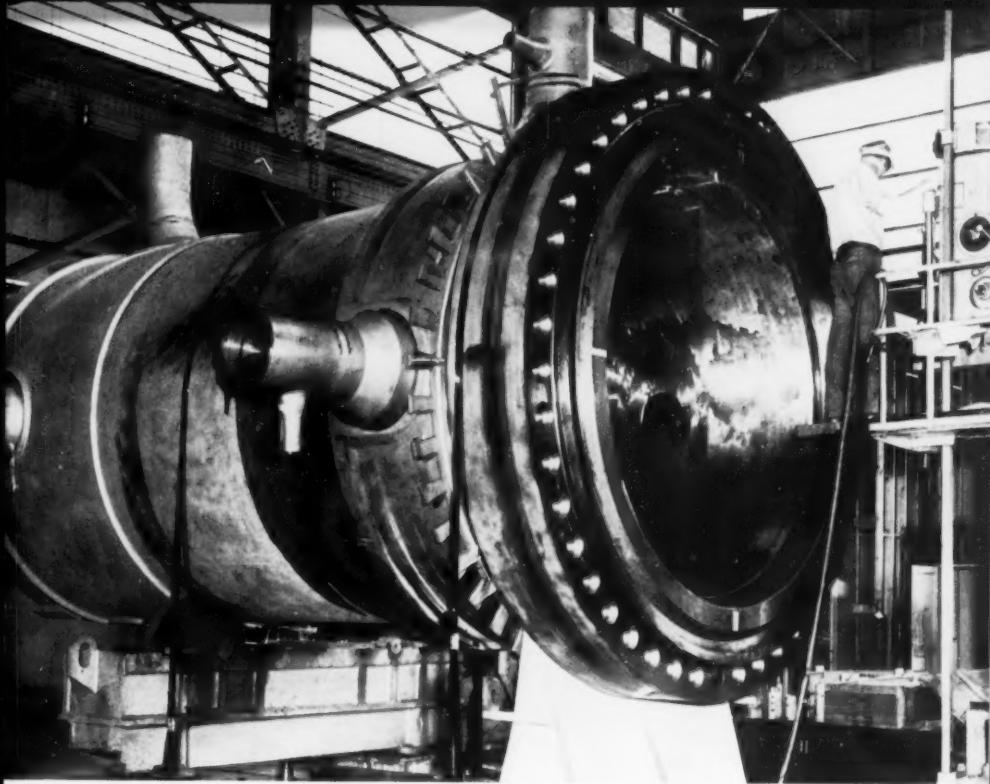
Eight-channel numerical tape control is available. You get indexing accuracy to $\pm .001$ " at a 45" diameter. And you can choose your table size from 30", 45", 60", and 80" diameters.

Bulletin 258 gives complete details.

Avey Division, The Motch & Merryweather Machinery Co., Box No. 1264, Cincinnati 1, Ohio.



For more data circle 352 on Postpaid Card



Courtesy Combustion Engineering, Inc.

Combustion Engineering specified more than "ordinary boring mills"

Combustion Engineering, Inc., pioneer manufacturer of heavy reactor vessels, concluded that ordinary boring mills would not produce the close tolerances and surface finish required in their critical operations. That is why they specified a Cincinnati Gilbert floor type boring mill for this job.

The workpiece is a 96-ton stainless steel reactor for a Naval nuclear power plant. The Gilbert machine is used to finish the boring of the bolt holes in the 20" thick flange, and to machine the outlet nozzles.

Combustion Engineering's high standards require

a surface finish of 32 R.M.S. on some of the bolt holes—an easy specification for a Gilbert, which can bore holes with a mirror finish, when required. A Tele-Vernier optical measuring system increases the speed and accuracy of machine positioning.

Work of equally high quality is produced on a number of other Gilbert boring mills at Combustion Engineering's Chattanooga and Windsor plants—proof that "those who buy Gilbert buy Gilbert again."

Write for new Bulletin 558.

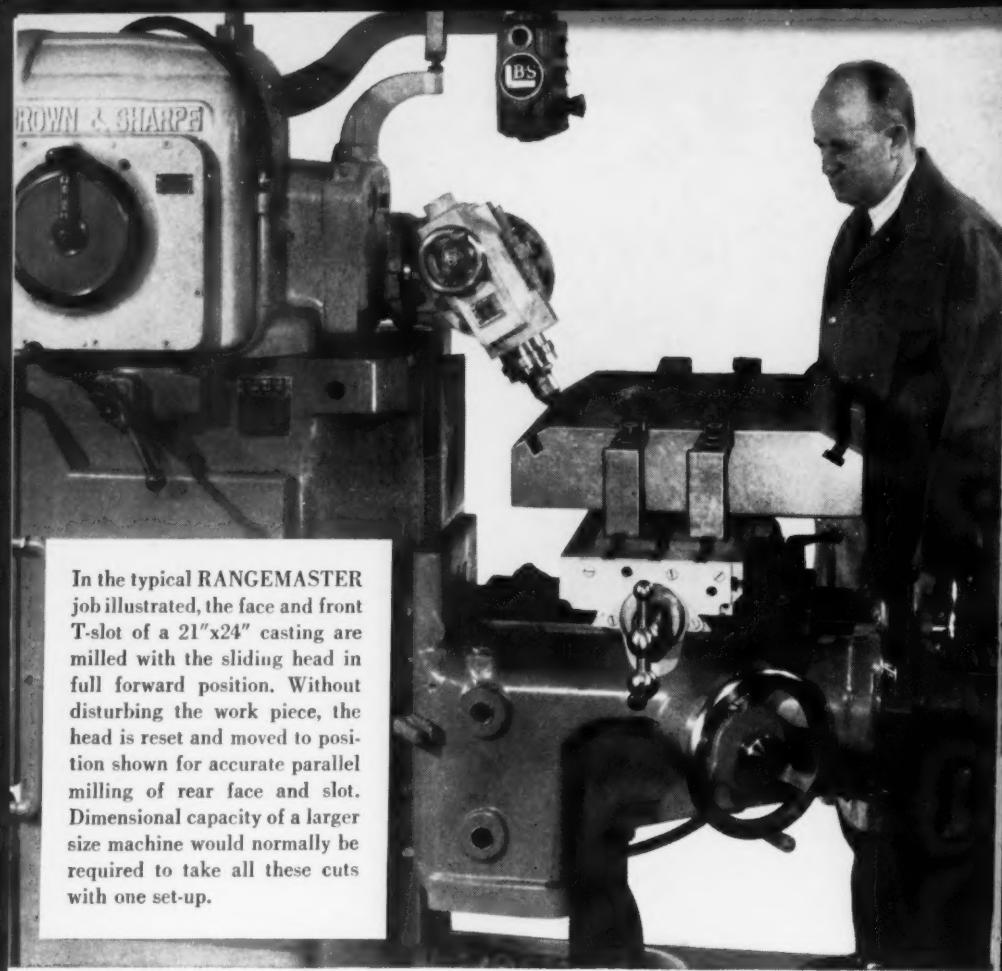
The Cincinnati Gilbert Machine Tool Co., 3348 Beekman Street, Cincinnati 23, Ohio.



GILBERT

For more data circle 353 on Postpaid Card

Ask for free catalog 558



In the typical RANGEMASTER job illustrated, the face and front T-slot of a 21" x 24" casting are milled with the sliding head in full forward position. Without disturbing the work piece, the head is reset and moved to position shown for accurate parallel milling of rear face and slot. Dimensional capacity of a larger size machine would normally be required to take all these cuts with one set-up.

"All-around" milling with one set-up ... the Brown & Sharpe RANGEMASTER®

The Brown & Sharpe RANGEMASTER provides the biggest work capacity in its class. It saves you the extra cost of a bigger machine — saves still more on set-up and tooling costs. You get all ram-type machine advantages, *plus* the full metal-removing ability of a conventional knee-

type machine of equivalent size. For toolroom, experimental, and prototype jobs — for "all-around" milling, it's by far your best investment. Universal or Plain.

For details, write . . . Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe  PRECISION CENTER

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New **BARNESDRIL** HONING MACHINE

FEATURES:

- INFINITE HONE FEED ADJUSTMENT
- SHORT-STROKING AT ANY POINT IN BORE
- REMOTE-CONTROL HONE TOOL ADJUSTMENT

This new Barnesdril No. 244 Honing Machine represents a completely new design in honing equipment, including many, added features for increased efficiency and flexibility.

Most noteworthy advantage is the new electric hone expansion which provides infinitely adjustable hone feeds with remote honing tool adjustment. This system eliminates all tubes and rectifiers usually found with electronic controls. Less headroom is needed because the cylinders are housed within the column. The external electric cabinet has been removed and electric controls have been built into two side panels on either side of the column. Set-up controls are protected by lock and key. With a new accurate reversal stroke, the machine short-strokes at any point in the bore, and is suited particularly for honing ported bores.

Get full details on this new honing machine from your local Barnesdril representative, or write for new bulletin No. 550.



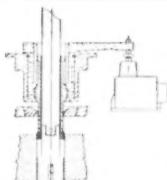
New also in the Barnesdril line is the Model No. 10 Honing Machine, for fast, economical finishing of bores $\frac{1}{4}$ " to $1\frac{1}{2}$ ". This machine may also be fully automated for fully automatic production lines.

For Controlled Finishing with Consistently Close Limits of Accuracy and Rapid Stock Removal, Use Barnesdril Honing Equipment.

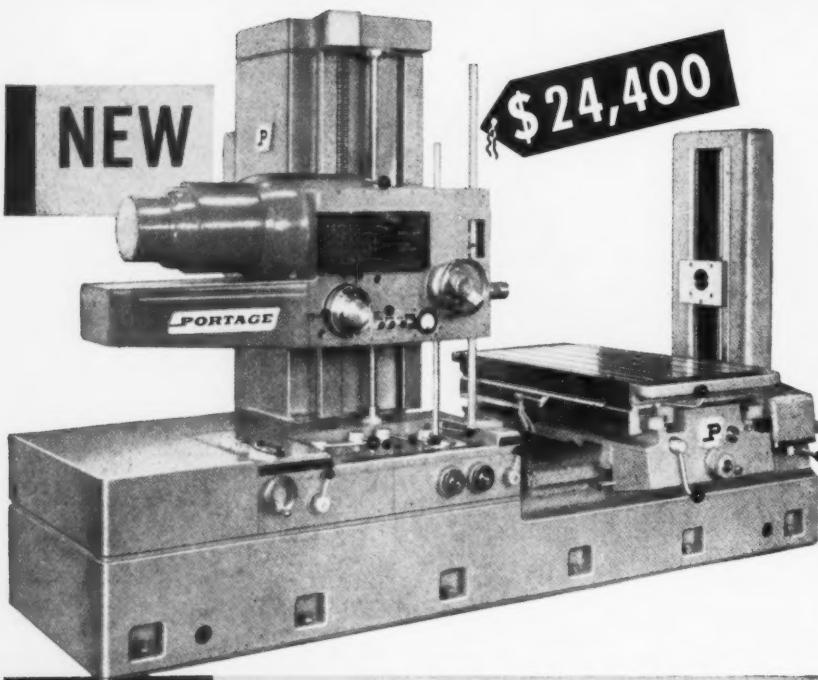


BARNES DRILL CO.
860 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE 13121 Puritan Avenue

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All Barnesdril honing machines provide outstanding accuracy through Plugmatic bore-to-bore sizing, which is a system gauging only on the bore diameter itself. Size is consistently maintained within .0002".



PORTAGE...3" diameter horizontal milling, drilling and boring machine



*Literature, just off the
press, covers features
and specifications.*

See our catalog in Sweets

Mr. Buyer...here's a 3 inch bar machine you can't afford not to investigate. It's new from the top of the column to the bottom of the base...All new speeds and feeds, plus a versatility of job applications make it a real money maker. All new construction features offer a truly strong, rugged machine...and the pay-off... it's priced amazingly low, every shop can afford one... write, wire or phone for complete information.

THE PORTAGE MACHINE COMPANY

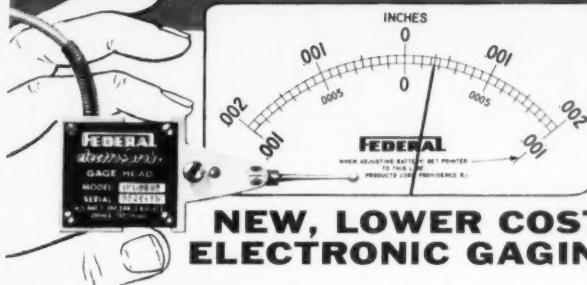


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electro-probe



NEW, LOWER COST ELECTRONIC GAGING

The new Electro-Probe Model 230 P-2 is far more than just another electronic test indicator.

- No need for special stands or holding fixtures.
- No need for external power.
- No voltage fluctuation or warm-up problems.
- No need for close gage head positioning during set-up.

The Electro-Probe introduces a new concept in Dimensional Control. Use of *printed circuits* and *transistors* means trouble-free performance. Connections are sure, operating current amazingly low — no heating or voltage regulation problems, no dependence on electrical outlets. Learn more about this truly portable, reliable, accurate and versatile gaging device.

Write for Literature.

FEDERAL PRODUCTS CORPORATION
9144 Eddy Street • Providence 1, R. I.

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FOR RECOMMENDATIONS IN MODERN GAGES . . .

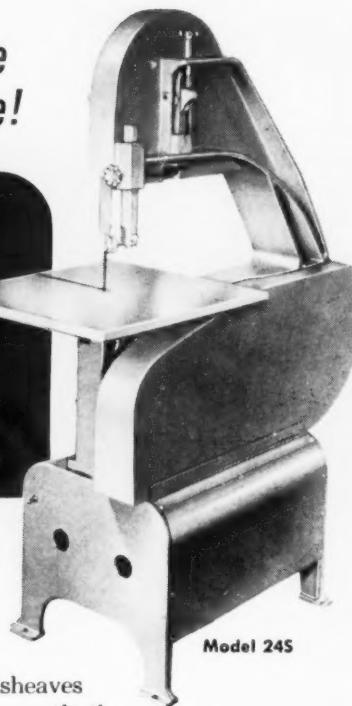
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

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**"BIG SHOP" performance
at a "SMALL SHOP" price!**

the **LOCKFORMER**
**BAND
SAW...**

- **Outperforms band saws
costing 3 times as much**
- **Built for heavy duty
shop cutting**



Model 24S

Simple V-Belt drive with conventional sheaves instead of power-hungry speed reducers . . . that's why the Lockformer Band Saw with $\frac{3}{4}$ hp. motor will match or *surpass* performance of costlier saws with ratings up to $1\frac{1}{2}$ hp.

Blade speeds of 100, 600 and 3000 fpm. make short work of forgings, bars, stacked bronze, brass, copper, aluminum and steel sheets, plates, stainless steel, wood and plastics. Cemented carbide blade guides mean no twisting, perfect blade control. Frictionless final drive chain means no chatter, no slipping. And the sealed ball bearings are lubricated for life.

Three-wheel Lockformer Model 24S with 24" throat can be had for only \$695.00* and two-wheel Model 14SM with 13½" throat costs \$445.00*.

*Prices subject to change without notice.

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**TIME SAVING,
MONEY MAKING
EQUIPMENT**

WRITE FOR BULLETIN

THE LOCKFORMER CO.
Dept. MS, 4615 West Roosevelt Rd., Chicago 50, Ill.
In Canada: Brown Boggs Foundry & Machine Co., Ltd.,
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FOR A REAL GRIP

**USE
UNIVERSAL
COLLET CHUCKS**



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. Tools can't slip and tool shanks don't get scored. Even tool stubs and broken drills can be used successfully. Sizes range from $1/16"$ to $1 1/2"$, with shanks to fit any machine. Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.



UNIVERSAL ENGINEERING CO. FRANKENMUTH 9, MICHIGAN

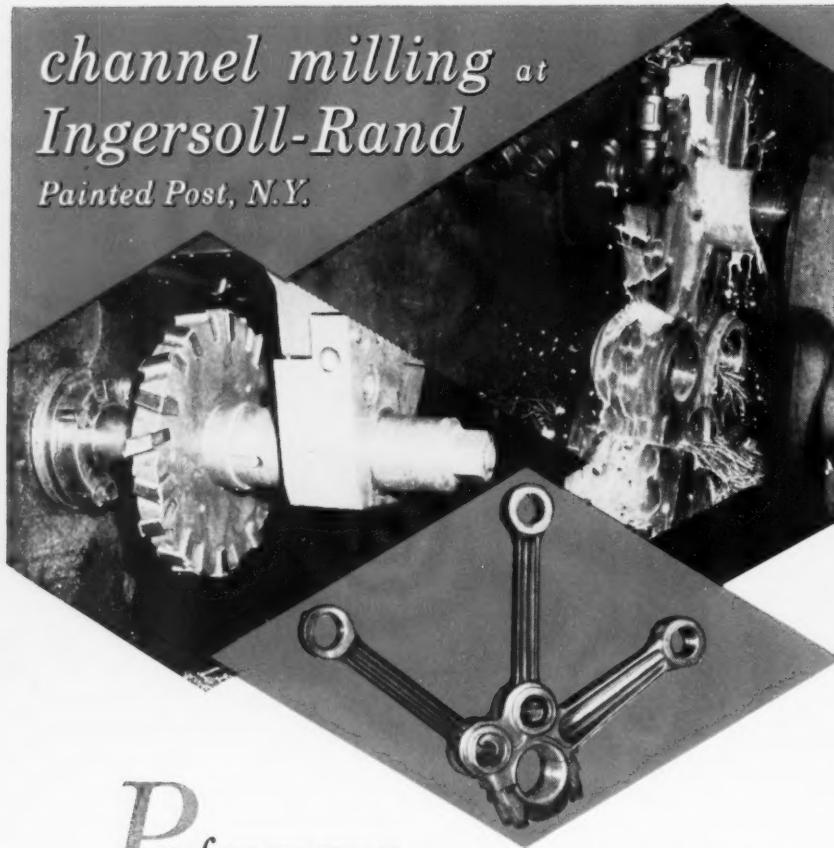
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September, 1959

modern machine shop 59

channel milling at Ingersoll-Rand

Painted Post, N.Y.



Performance:

With one pass, the cutter takes the full depth of $2\frac{3}{4}$ "
cut at 15 rpm, 64 surface feet per minute. *Objective and Operation* —

Get the metal out in the fastest, cheapest way possible. A job for a modern
milling machine. *Workpiece* — Drop forged steel master connecting rods for stationary SVG gas
compressors, widely used in oil field work to re-pressure wells, pipelines, and so forth.

Cutting Tool — A 16-inch O K alternate angle or staggered tooth milling cutter with high speed
steel blades set at the correct axial and radial rake to give a shearing action
and free chip flow. O K tapered and serrated blades combine maximum strength
with ease of replacement and adjustment for wear. This is just one of hundreds of metal
removing operations successfully performed with O K cutters at Ingersoll-Rand plants.

Write for Catalog 13 FREE. THE O K TOOL COMPANY, INC.
80 ELM STREET, MILFORD, NEW HAMPSHIRE



modern milling



cutters for



modern



milling machines

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Barber-Colman's new 36-speed tracer lathe shows startling results on short-run work. Total costs slashed at speeds which give 30-minute tool life.

Here is evidence that general-purpose lathes designed for carbide-ceramic speeds are one of the most profitable investments you can make.

The reason lies in the expendability of carbide inserts. Economical machine speeds with throwaways are far beyond those recommended in machinability tables. Speeds between 600 and 900 sfm, calculated to yield 30-minute tool life, reduce *total* cost per piece by as much as 80%.

An example is this 4140 steel forging — 32 in. long by 8 in. max. dia. It is step turned in 6 min. cutting time on a Barber Colman 36-speed lathe. A hot stream of chips makes it necessary to shield the entire work area, a requirement for which the front-mounted tracer offers definite advantages. Thirteen different diameters are turned and two ends faced at 600 sfm, with .020 ipr feed and 1/4 in. depth of cut. Turning is done by a 1/2-in. triangular carbide insert. Floor-to-floor time is 19 minutes against the former time of 2.1 hours.

The objective in setting feeds and speeds was 30-min. tool life (per edge). But, even at 600 sfm, longer life is experienced due to the machine's unusual rigidity.

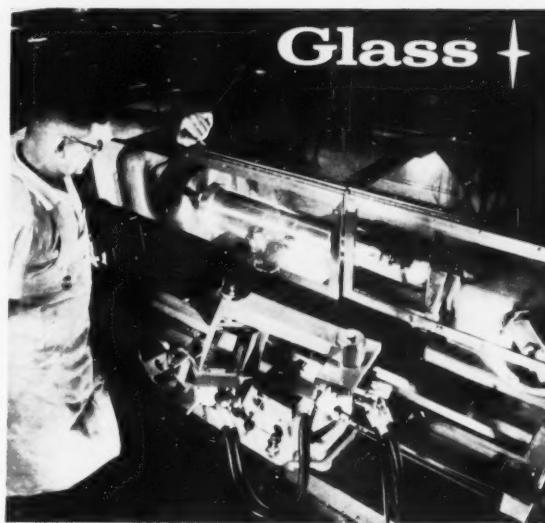
More examples . . .

Other jobs being turned at ultra-high speeds include long lead screws — 750 sfm at 1/16 in. depth of cut and .018 ipr feed. The machine turns out three times as much work as two lathes formerly used. In another step-turning operation, tests already prove a 52% gain over the previous time with tracer, and the maximum processed rate has not yet been established. These are savings on jobs averaging 6 to 50 pieces.

Versatile tooling . . .

This hydraulic tracer offers two advantages for increasing utilization of a lathe. *First*, it will duplicate con-

Tracing Under



sistently within .001 in. on diameter or length, and it will operate at 90° to the work axis.

Second, the attachment can be removed and replaced by the regular compound in just 20 minutes. This versatility permits economical use of the machine for turning, boring, roughing and finishing, tracing, and both internal and external threading.

Quality features . . .

The lathe itself gives you a new combination of design features that improve performance at high speeds:

(1) Unusual rigidity is provided by the 30 in. span of the front carriage way, scientific bed webbing, 400-lb tailstock, and precision-ground spindle supported at both ends and in the middle by three sets of tapered roller bearings.

(2) Headstock is a dense, Meehanite casting which responds best to vibrations encountered at high speeds.

(3) All headstock gears are hardened and ground.

(4) Automatic pickup on the carriage simplifies positioning of the two-speed tailstock through carriage feed or traverse.

Information . . .

Write today for our new 16-page catalog showing how this new Barber-Colman precision machine can pay for itself quickly as a replacement for an old lathe.

Barber-Colman Company



84 Loomis Street, Rockford, Illinois

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SAVE THIS AD FOR FUTURE REQUIREMENTS—DEALER INQUIRIES INVITED



NEW SIZES ADDED DAILY. IF NOT LISTED HEREIN—INQUIRE

FIELD

WHY WAIT

DELIVERY FROM STOCK

SPECIAL Right & Left Hand High Speed Taps-Dies & Thread Plug Gages

SIZE **THREADS PER INCH**

1/8	32-36
1/4	32-36
5/16	32-36
9/32	32-36
11/32	32-36
13/32	32-36
15/32	32-36
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23/32	32-36
25/32	32-36
27/32	32-36
29/32	32-36
31/32	32-36
1/2	32-36
9/16	32-36
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**How B&W JOB-MATCHED EXTRUSIONS
can reduce the cost of your finished product**

...they meet your design and production requirements because the extrusion process can produce a variety of shapes in solid or tubular form
...they meet product end-use specifications because you have a choice of high-alloy and stainless steels, or special non-ferrous metals and alloys

...they save production time because operations can often be reduced to a mere cutting to length and a few simple finishing operations
Be sure it's B&W when you specify extrusions. Call your local B&W District Sales Specialist, or write for Bulletin TB-413 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



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B&W

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

Metal Show — Booth 528
International Amphitheater
Chicago — November 2-6

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

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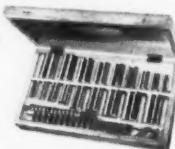
September, 1959

modern machine shop 63

THE WAY TO CUT KEYWAYS

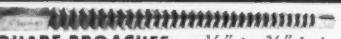
Minute Man

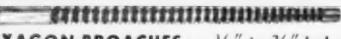
**KEYWAY
BROACH KIT**



In one minute and for as little as one cent you can cut a keyway with the Minute Man Keyway Broach Kit. For keyways from $\frac{1}{16}$ " to 1" in any bore from $\frac{1}{4}$ " to 3".

**SAVE TIME AND MONEY
WITH THESE OTHER STANDARD
STOCK BROACHES**


SQUARE BROACHES — $\frac{1}{8}$ " to $\frac{3}{4}$ " holes


HEXAGON BROACHES — $\frac{1}{8}$ " to $\frac{3}{4}$ " holes


ROUND BROACHES — $\frac{1}{4}$ " to 1" holes

**SEND FOR CATALOG
AND PRICE LIST**

**The duMont Corp.
Greenfield, Mass.**

MAIL FREE BROACH CATALOG AND
PRICE LIST S describing Square Broaches,
Hexagon Broaches, Production Type Keyway
Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

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Meetings

Important Meeting Dates



SEPTEMBER 13-17 • Pressed Metal Institute, Annual Meeting, Stanley Hotel, Estes Park, Colo. Institute headquarters: 3673 Lee Rd., Cleveland 20, Ohio.

SEPTEMBER 14-17 • Society of Automotive Engineers, National Farm, Construction and Industrial Machinery Meeting, Production Forum and Display, Milwaukee Auditorium, Milwaukee. Society headquarters: 485 Lexington Ave., New York 17, New York.

SEPTEMBER 16-17 • American Die Casting Institute, Annual Meeting, Edgewater Beach Hotel, Chicago. Institute headquarters: 366 Madison Ave., New York 17, New York.

SEPTEMBER 21-22 • Steel Founders' Society of America, Fall Meeting, Homestead Hotel, Hot Springs, Va. Society headquarters: 606 Terminal Tower, Cleveland 13, Ohio.

SEPTEMBER 21-25 • Instrument Society of America, Instrument-Automation Conference and Exhibit, International Amphitheatre, Chicago. Society headquarters: 313 Sixth St., Pittsburgh 22, Pennsylvania.

SEPTEMBER 28-OCTOBER 1 • Association of Iron and Steel Engineers, Annual Meeting and Convention, Sherman Hotel, Chicago. Association headquarters: 1010 Empire Bldg., Pittsburgh 22, Pennsylvania.

SEPTEMBER 28-OCTOBER 1 • American Welding Society, National Fall Meeting, Sheraton-Cadillac Hotel, Detroit. Society headquarters: 33 W. 39th St., New York 18, New York.

OCTOBER 7-9 • Gray Iron Founders Society Inc., Annual Meeting, Fairmont Hotel, San Francisco. Society headquarters: 930 National City-E. 6th Bldg., Cleveland 14, Ohio.

OCTOBER 8-10 • American Society of Tool Engineers, Semi-Annual Meeting, Chase-Park and Plaza Hotels, St. Louis, Mo. Society headquarters: 10700 Puritan Ave., Detroit 38, Michigan.

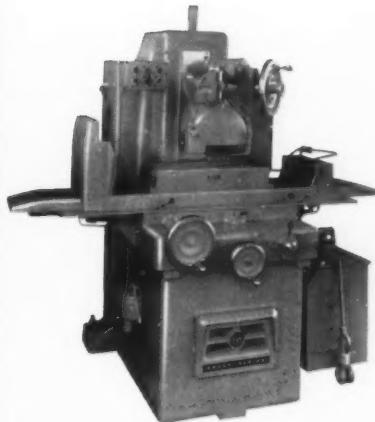
NEW *from* GRAND RAPIDS

and just look at all these features:

- Powered vertical movement of wheel head*
- Instantly variable hydraulic table speed
- Greased-for-life precision ball bearing spindle with two speeds for long wheel life
- Head carried on protected pre-loaded ball bearing ways
- Equipped with Vickers vane type pump and our own control valve for infinite longitudinal table speeds from 5" to 120' per minute
- Variable speeds hydraulic cross feed and continuous cross feed
- Rugged, one-piece casting column and base for permanent rigid alignment
- Ultimate in accuracy with micro inch finish at production speeds

*Automatic downfeed available as optional feature

No. 350 PRECISION
TOOL ROOM TYPE
HYDRAULIC FEED
SURFACE GRINDER



For full details, just
send a note on your
letterhead.

GALLMEYER & LIVINGSTON CO.
408 Straight Ave., S.W., Grand Rapids, Mich.

**GALLMEYER
& LIVINGSTON**





Man-made diamonds add the newest "Touch of Gold" value to carbide grinding

In carbide grinding the product-improving, cost-cutting "Touch of Gold," created by Norton leadership in diamond wheel development, began back in 1930. Today, man-made diamonds are adding something new to the "Touch of Gold." Their use as abrasives is steadily increasing, because of their improved performance and economy.

Norton was first to introduce all three bond types of diamond wheels . . . manufactures with complete uniformity of specification . . . produces the largest line . . . and certifies the diamond content of each wheel. Today, similar pioneering continues Norton leadership in the use of man-made diamonds . . . bringing you better performance, longer service life and

lower grinding cost for every dollar you spend. NORTON COMPANY, Worcester 6, Massachusetts.

NORTON

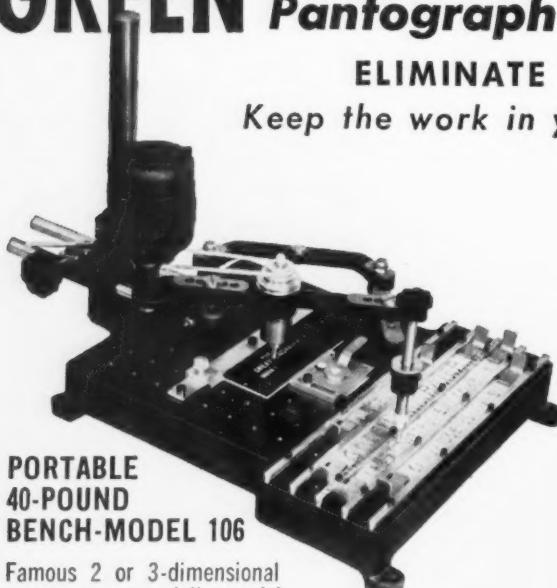
A B R A S I V E S

Making better products . . . to make your products better
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electromechanics • Electromechanics — BEHRMANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

GREEN Pantograph Engravers

ELIMINATE DELAYS!

Keep the work in your own plant.



PORTABLE 40-POUND BENCH-MODEL 106

Famous 2 or 3-dimensional engraver, successfully used by thousands, features 5 positive, accurate pantograph ratios. Versatile ball bearing spindle has three speeds up to 14,000 rpm; height of pantograph and position of cutter are continuously adjustable; one copy carrier (supplied) accepts all standard master type sizes.

The Model 106 has proven incomparable for speed and accuracy . . . yet reasonably priced.

Cutter grinders, rotary tables, master letters, compound slides, name plates and all required accessories. For complete information, write to



MODEL D2 HEAVY-DUTY 2-DIMENSIONAL

- 575 pounds — rigid, sturdy, precise
- Vertical adjustment of copy table automatic with Pantograph
- Unobstructed on three sides to take large work
- Micrometer adjustment for depth of cut
- Ball-bearing construction throughout — super-precision ball bearing spindle
- Spindle speeds up to 26,000 rpm for engraving or machining modern materials
- Ratios 2 to 1 to infinity — master copy area 26" x 10"
- Vertical range over 10"



**GREEN
INSTRUMENT
COMPANY, INC.**

392 PUTNAM AVENUE, CAMBRIDGE 39, MASS.

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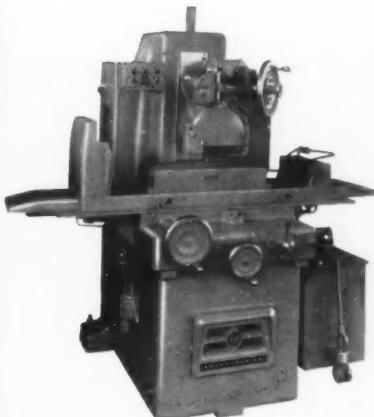
NEW from GRAND RAPIDS

and just look at all these features:

- Powered vertical movement of wheel head*
- Instantly variable hydraulic table speed
- Greased-for-life precision ball bearing spindle with two speeds for long wheel life
- Head carried on protected pre-loaded ball bearing ways
- Equipped with Vickers vane type pump and our own control valve for infinite longitudinal table speeds from 5" to 120' per minute
- Variable speeds hydraulic cross feed and continuous cross feed
- Rugged, one-piece casting column and base for permanent rigid alignment
- Ultimate in accuracy with micro inch finish at production speeds

*Automatic downfeed available as optional feature

**No. 350 PRECISION
TOOL ROOM TYPE
HYDRAULIC FEED
SURFACE GRINDER**

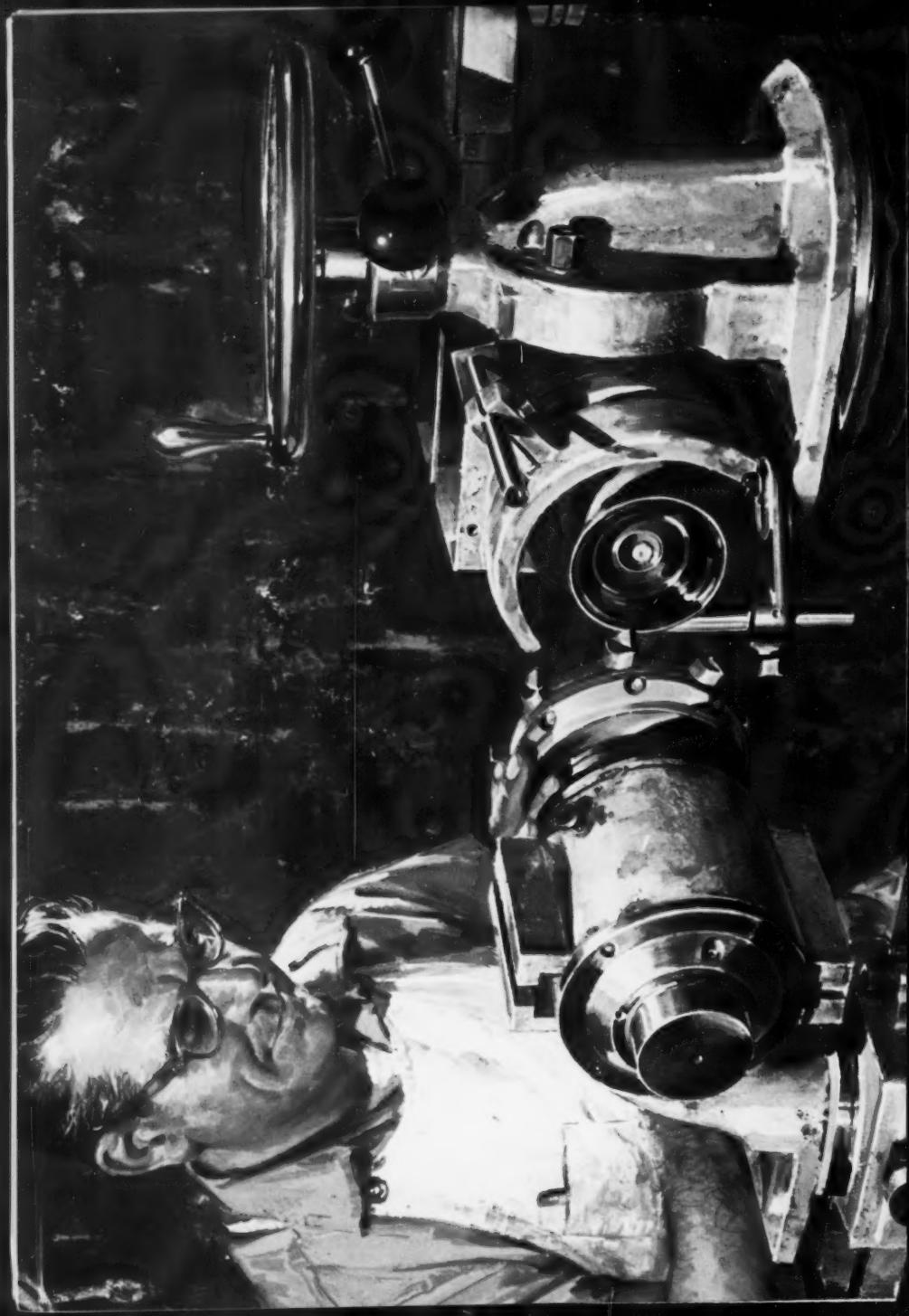


For full details, just send a note on your letterhead.



GALLMEYER & LIVINGSTON CO.
408 Straight Ave., S.W., Grand Rapids, Mich.

**GALLMEYER
& LIVINGSTON**





Man-made diamonds add the newest "Touch of Gold" value to carbide grinding

In carbide grinding the product-improving, cost-cutting "Touch of Gold," created by Norton leadership in diamond wheel development, began back in 1930. Today, man-made diamonds are adding something new to the "Touch of Gold." Their use as abrasives is steadily increasing, because of their improved performance and economy.

Norton was first to introduce all three bond types of diamond wheels . . . manufactures with complete uniformity of specification . . . produces the largest line . . . and certifies the diamond content of each wheel. Today, similar pioneering continues Norton leadership in the use of man-made diamonds . . . bringing you better performance, longer service life and

lower grinding cost for every dollar you spend. NORTON COMPANY, Worcester 6, Massachusetts.

NORTON
A B R A S I V E S

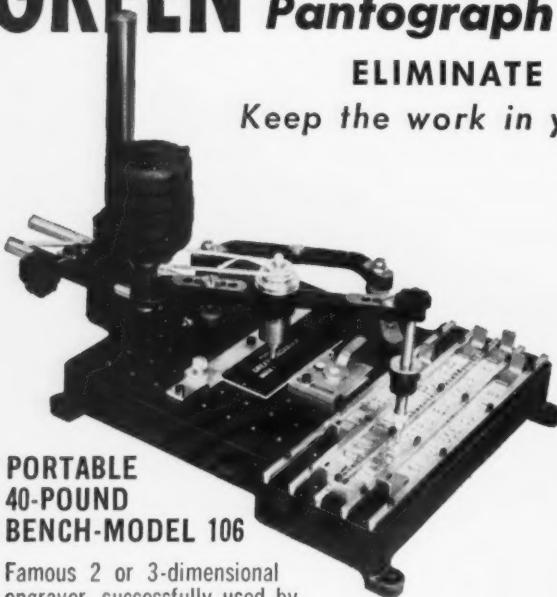
Making better products . . . to make your products better
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrotechnicals • Electrochemicals • Refractories • Pressure-Sensitive Tapes • Sharpening Stones • Pressure-Sensitive Tapes

GREEN

Pantograph Engravers

ELIMINATE DELAYS!

Keep the work in your own plant.



PORTABLE 40-POUND BENCH-MODEL 106

Famous 2 or 3-dimensional engraver, successfully used by thousands, features 5 positive, accurate pantograph ratios. Versatile ball bearing spindle has three speeds up to 14,000 rpm; height of pantograph and position of cutter are continuously adjustable; one copy carrier (supplied) accepts all standard master type sizes.

The Model 106 has proven incomparable for speed and accuracy . . . yet reasonably priced.

Cutter grinders, rotary tables, master letters, compound slides, name plates and all required accessories. For complete information, write to



MODEL D2 HEAVY-DUTY 2-DIMENSIONAL

- 575 pounds — rigid, sturdy, precise
- Vertical adjustment of copy table automatic with Pantograph
- Unobstructed on three sides to take large work
- Micrometer adjustment for depth of cut
- Ball-bearing construction throughout — super-precision ball bearing spindle
- Spindle speeds up to 26,000 rpm for engraving or machining modern materials
- Ratios 2 to 1 to infinity — master copy area 26" x 10"
- Vertical range over 10"



**GREEN
INSTRUMENT
COMPANY, INC.**

392 PUTNAM AVENUE, CAMBRIDGE 39, MASS.

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Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

LOW COST • Priced at less than \$500, delivered.

BIG CAPACITY • Up to 2" square solids, 3½" o. d. pipe and tubing, 3" angle iron, and 4" channels. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2" x 2" hardened steel bar in 16 seconds . . . practically any metal at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

VERSATILITY • Cuts cold rolled, stainless, and alloyed steel; cast iron; and non-ferrous metals.

ECONOMY • Occupies minimum floor space . . . eliminates annealing costs . . . gives more cuts per wheel as a result of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. Little or no set-up time required.

NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

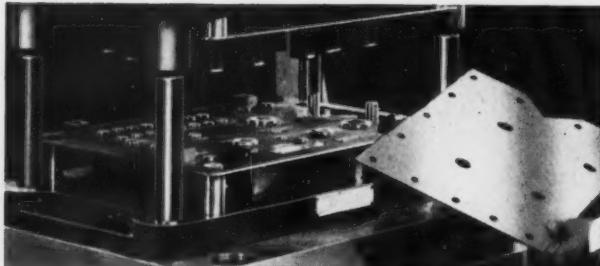
Very likely your own distributor already stocks the Model 1-A SEVER-ALL Abrasive Cutting Machine and Wheels. If not, we'll give you the name of your nearest SEVER-ALL distributor. We'll also be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106**.

**ALLISON-CAMPBELL DIVISION
AMERICAN CHAIN & CABLE**

931 Connecticut Avenue, Bridgeport 2, Conn.
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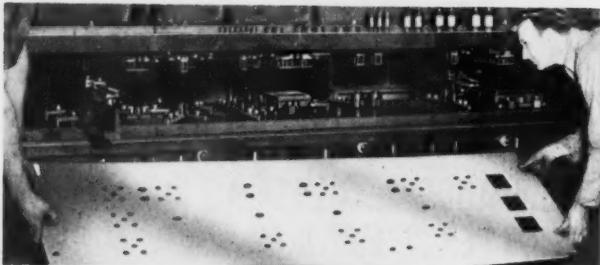


OVER 2700 PLANTS are saving money with WHISTLER DIES



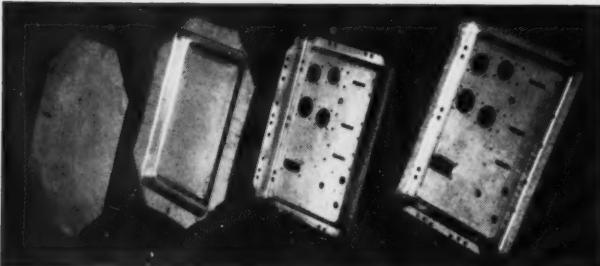
MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



manufacturer
of all types of
CUSTOM DIES
for over 40 years

**WRITE FOR
COMPLETE DETAILS**

S. B. WHISTLER & SONS, INC., 740 Military Rd., Buffalo 23, N.Y.

Mail the following: Magna-Die Catalog Adjustable Die Catalog
 More information on custom die work

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____



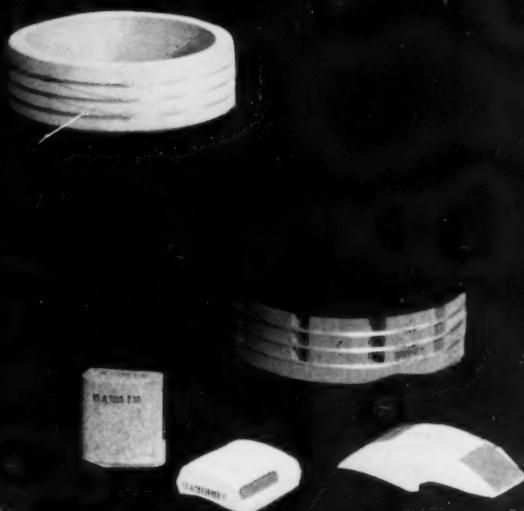
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For best results
in Surface Grinding . . .
Always Use Blanchard Wheels!

The flexibility in application of your Blanchard Surface Grinder enables you to attain peak production at lowest cost on hundreds of different grinding jobs. *But, it is very important that you use the right wheel for each job!*

Blanchard makes and stocks a great variety of silicate, resinoid and vitrified bonded wheels and segments. Ask your Blanchard representative to help you select the wheel—or wheels—best suited to your requirements. Call or write him today. And may we send you a copy of "The Art of Blanchard Surface Grinding" (4th Edition)?

THE  BLANCHARD MACHINE COMPANY
64 State Street,
Cambridge 39, Mass., U. S. A.



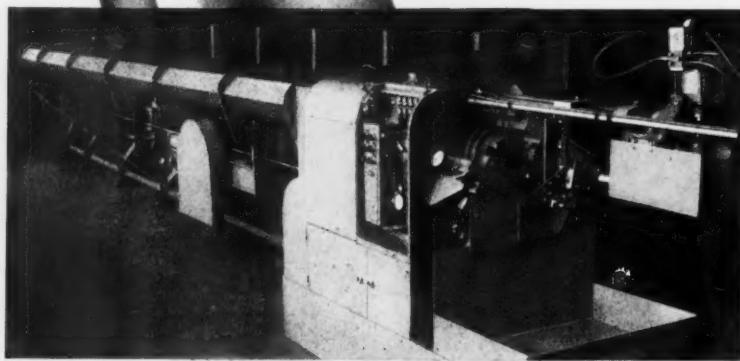
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the Modern Way

Fast CUTTING-OFF of TUBING and BAR STOCK

Automatic operation—from loading to final cut-off. Handles tubing up to 8" O.D. Very fast. With special tools, parts being cut off may be formed, grooved, flanged or chamfered in a single operation—at a high rate of speed.



WRITE for CATALOG

New catalog describes all models—gives production figures. Mailed on request.

MODERN MACHINE TOOL CO.
2005 Losey, Jackson, Michigan

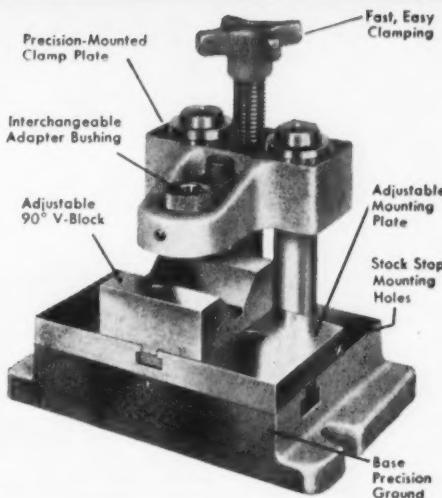
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REPCO Time-Saving Tools

ADJUSTABLE V-BLOCK DRILL JIG

Saves Set-Up Time—
Increases Output

Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity #80 to $\frac{1}{2}$ " diameter. Handles stock from $\frac{1}{4}$ " to 2" diameter.

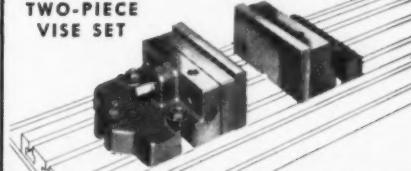


TRUE-CENTER ADJUSTABLE TOOL HOLDER



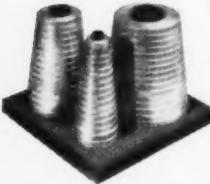
The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides fast adjustment of the main body to compensate for as much as $\frac{1}{8}$ " machine misalignment. Cuts down on tool wear, breakage, and scrap.

TWO-PIECE VISE SET



Save time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".

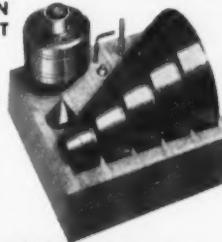
CHUCK JAW TRUING-RING SET



This Ring Set saves time, cuts cost of boring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by $\frac{1}{16}$ " increments. Handy peg-type rack keeps rings in place.

COMBINATION LIVE-CENTER SET

Heavy-duty live center plus six interchangeable adaptors, ranging from a point to $\frac{1}{4}$ " dia. bell. Saves costly set-up and machining time necessary to make large-diameter centers. Straight and various taper shanks available.



Write for complete information—Exclusive agent territories open.



ROCKFORD ENGINEERED PRODUCTS CO.

23rd Ave. & 20th St., Rockford, Illinois

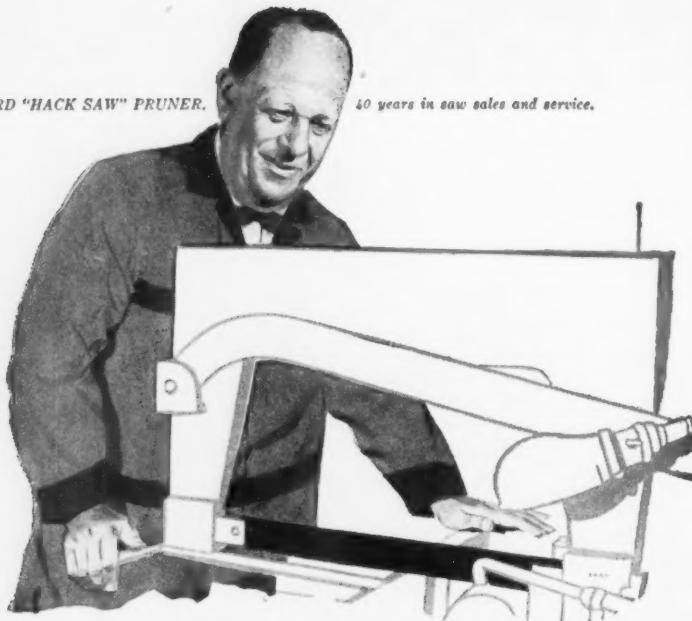
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HOWARD "HACK SAW" PRUNER.

40 years in saw sales and service.



PRODUCTION SPEED AND ACCURATE CUTTING WITH
LENOX POWER HACK SAW BLADES

You can count on increased production with LENOX power blades featuring long-wearing teeth and straight cutting performance. LENOX power blades are heat treated and toughened under modern electronic controls to guarantee strong, uniform hardness. For a better blade . . . better made . . . you can always depend on LENOX.



MO-SPEED TYPE High speed steel, all-hard.
HACKMASTER TYPE High speed welded edge, shatterproof.

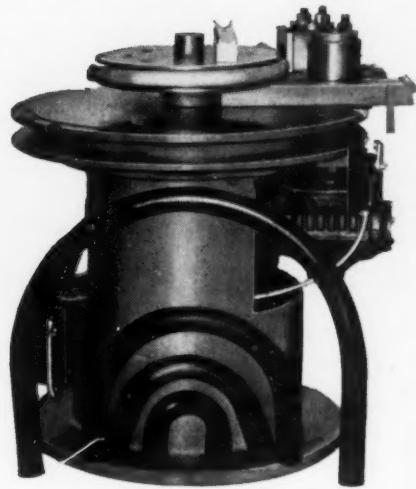


AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASSACHUSETTS • U.S.A.

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any size
or shape

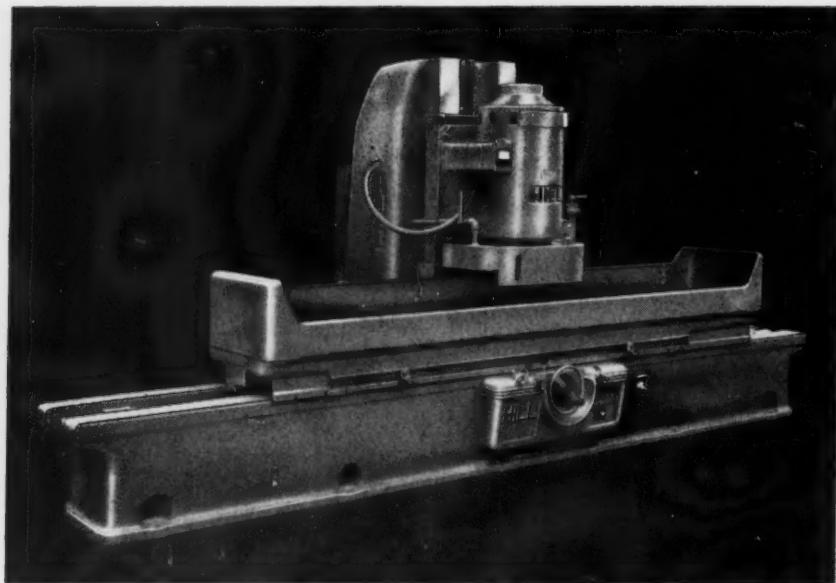


Whatever the size or shape of the bend for your
pipe, tube or structural metal part, a
PEDRICK PRODUCTION BENDER can do the job
fast, accurately and economically. Let us
demonstrate. Write PEDRICK TOOL AND
MACHINE Co., 3640 N. Lawrence St.,
Philadelphia 40, Pa. Dept. 5.

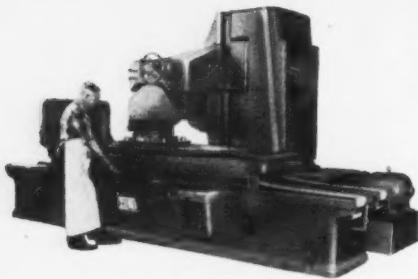
Free "Pedrick Line" Bulletin.
Write today.

PEDRICK
PRODUCTION BENDERS

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Hill Grinder ELIMINATES MILLING OPERATION



For grinding to extremely close tolerances on flats, angles, irregular and special shaped surfaces the HILL Horizontal Spindle grinder is recommended.

Expensive, time consuming milling operations can be eliminated in finishing die blocks, bolster plates etc. with the new HILL Vertical Spindle Hydraulic Surface Grinder. Equipped with either 75 or 100 HP main spindle motor, the segmented grinding wheel provides fast stock removal and produces an accurate finish in approximately half the time required for a combined milling and grinding operation.

The HILL fully hydraulic reciprocating table is adaptable to a wide variety of stock sizes having flat surfaces. Table widths are 18", 24" and 30" with table lengths from 5 to 20 feet.



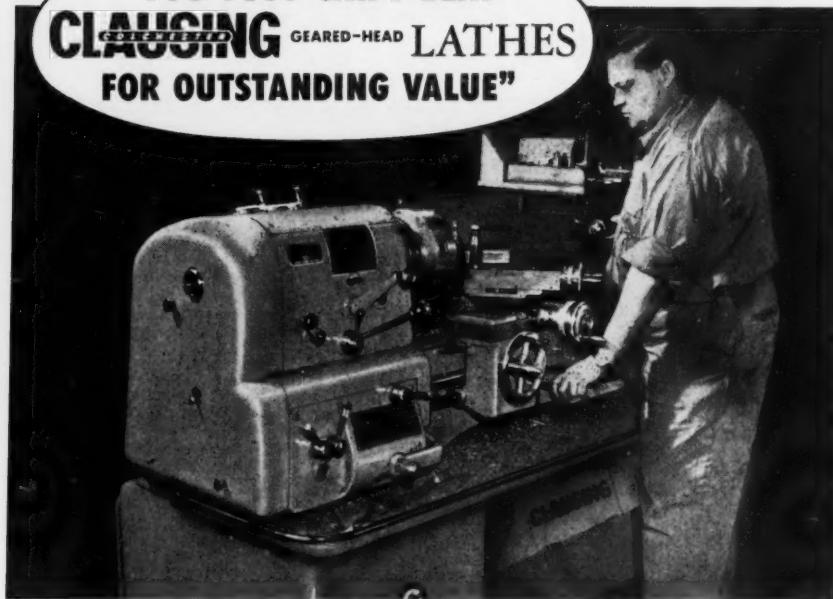
The **HILL ACME** Company

1201 WEST 65TH STREET, CLEVELAND 2, OHIO

Also manufacturers of: HILL GRINDING AND POLISHING MACHINES • ACME FORGING MACHINES • ROTARY SCRAP SHEARS • ALLIGATOR SHEARS • "CLEVELAND" KNIVES AND SHEAR BLADES • MATERIAL HANDLING EQUIPMENT • BAR-BILLET SHEARS

For more data circle 375 on Postpaid Card

"YOU JUST CAN'T BEAT
CLAUSING GEARED-HEAD LATHES
FOR OUTSTANDING VALUE"



HERE'S PROOF OF PERFORMANCE

"We like everything about our Clausing lathe. The spindle capacity 'beef' of the machine and ease of operation are impressive. The finish we get is phenomenal. And, you just can't beat Clausing-Colchester geared-head lathes for outstanding value!"

THE JARO MACHINE & TOOL COMPANY

Clausing geared-head lathes do lead their field in capacity, performance and value. Here's why:

They're bigger in capacity than other lathes in their class. Larger spindles, larger thru-hole capacity, larger bearings for heavier work. 17" lathe spindle, for example, has $3\frac{1}{8}$ " thru-hole — 15" lathe, $2\frac{1}{8}$ " hole — 13", $1\frac{1}{8}$ " hole.

Have heavy-duty construction throughout. Bed ways are induction hardened. Gears in head and quick-change box run in bath of oil. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile steel.

Built for precision performance — to Amer-

ican standards of toolroom lathe accuracy. Have Gamet Micron tapered roller bearings with oil flow lubrication — the most advanced and accurate bearings known to industry.

Each is an outstanding value. 13" cabinet base models, including motor and controls, start at \$2302; 15" cabinet base at \$3221; 17" at \$5070. You owe it to yourself to investigate before investing in any lathe.

Lathe Capacities: 17" lathe: 54" and 75" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

CLAUSING

CLAUSING DIVISION

ATLAS PRESS COMPANY

9-110 N. PITCHER ST. • KALAMAZOO, MICH.

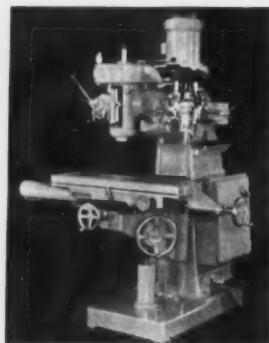
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September, 1959

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INCREDIBLE NO!

THESE SAVINGS ARE REAL



GORTON MACHINE TOOLS,

both standard and custom-designed, are today *paying for themselves in record time. Here are just three typical examples:

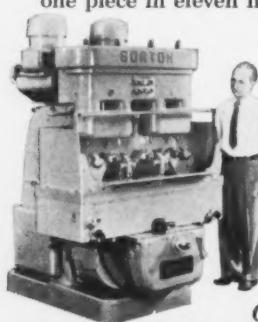
from **8 Hours** per piece
to **5 Minutes** per piece

This standard Gorton Trace-Master Hydraulic Duplicator was purchased to profile a complex part from a simple master. Previous cost of this operation was \$102.40. Present cost with this Gorton machine is \$1.07. Saving per piece is \$101.33.

*Cost figures were arrived at by using \$2.80 per hour for operator's time and \$10.00 per hour, machine rate.

cost saving per piece... **\$1,139.20**

This Gorton Horizontal Mill with special holding fixture, tooling, hydraulics, etc., was purchased to machine thirty-five impeller blades from the solid, involving compound curvatures, thicknesses and depths. Former production time was one piece in 100 hours. Present time on this new machine is one piece in eleven hours. Machine was paid for after machining 22 pieces.



**\$50,000 machine pays for
itself in 41 Weeks**

This Gorton 4-spindle "Automatic Cycle" Duplicator was purchased to mill out recesses in a round steel part. Original production time on a manually operated single spindle duplicator was 60 pieces per hour. Present production on this new machine is 204 pieces per hour. Cost saving is 71%.

Cost reduction and improved accuracy
are important to you today. We shall be glad to analyze
your needs and make specific recommendations on request.



GEORGE **GORTON** MACHINE CO.

1709 RACINE STREET

SINCE 1893 Tracer-Controlled Pantographs, Duplicators—standard and special... Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

RACINE, WISCONSIN

September, 1959

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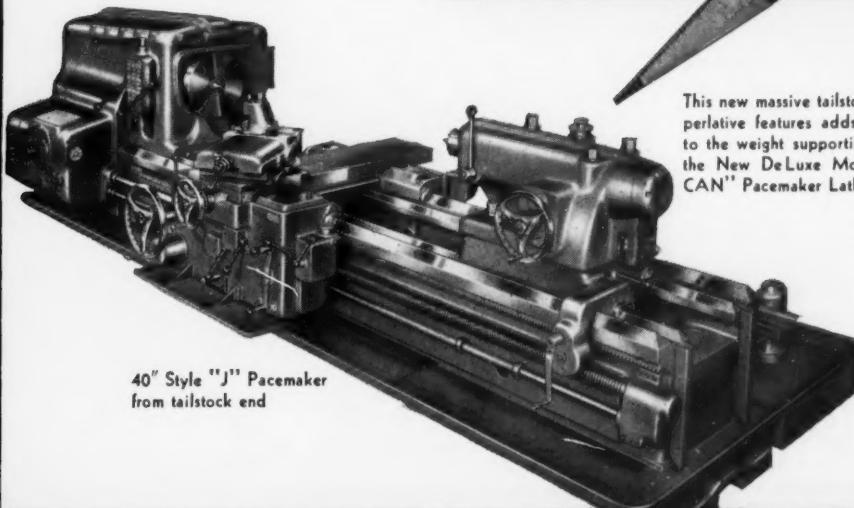
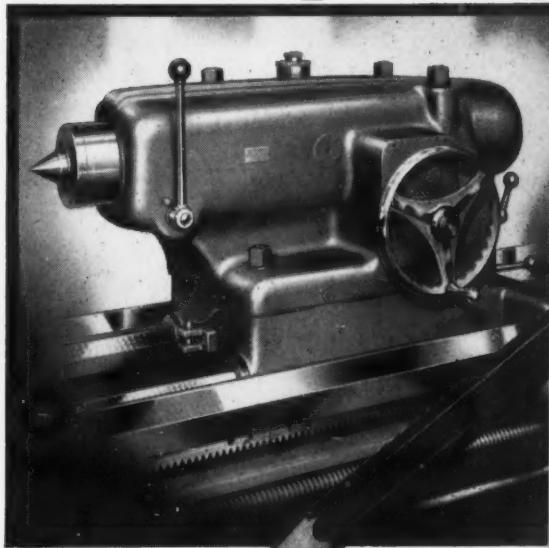


LOOK Compare

This new mammoth SUPER TAILSTOCK now furnished on "AMERICAN" DeLuxe Model 32" Style "I" and 40" Style "J" Lathes has . . .

- 7½" Diameter Spindle
- Long Travel
- Unparalleled Rigidity
- Circular Depth Dial—Easily Read
- Built in Single and Two-Speed Types
- Convenient Front Controls
- Either Stationary or Ultra Capacity Built-in Anti-Friction Center
- Both Manual and Power Movement along Bed
- Plunger Pump Oiled including Bed Ways

Send for Bulletin No. 144 for complete details.



40" Style "J" Pacemaker
from tailstock end

This new massive tailstock with its superlative features adds tremendously to the weight supporting capacity of the New DeLuxe Model "AMERICAN" Pacemaker Lathe.

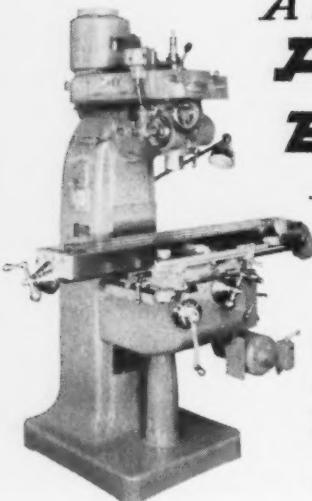
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

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A Lot More
POWER

A Lot More
ACCURACY
ECONOMY too!

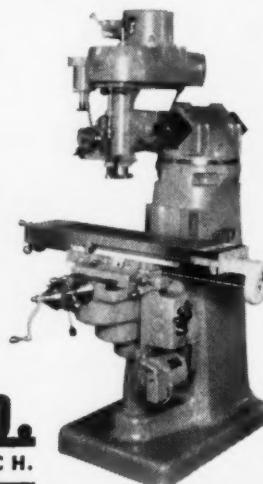


INDEX "SUPER 55" VERTICAL MILL

- 1 1/2 HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

INDEX "45" VERTICAL MILL

- Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.

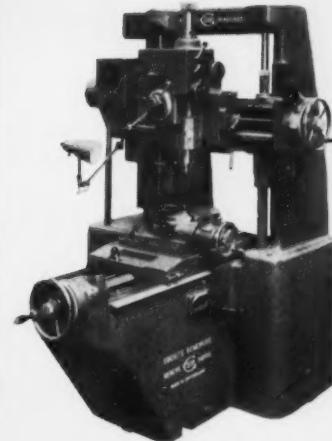


INDEX Machine Co.
544 N. MECHANIC ST., JACKSON, MICH.

For more data circle 379 on Postpaid Card



A



SIP No. 3K JIG BORING MACHINE
Send for Catalog 1173

Illustrated is the machining of a magnesium casting for an electronic unit . . . (A) drilling, boring and counterboring 37 holes, 62 diameters ranging from 0.255" to 5.125" . . . (B) drilling, boring and counterboring 11 holes, 16 diameters ranging from 0.100" to 0.787". Here's the record:

MACHINING TIME (A) 8 HOURS, 15 MINUTES

MACHINING TIME (B) 2 HOURS, 0 MINUTES

How's that for Production!

The machine that does it is the SIP No. 3K Jig Boring Machine. It has what it takes—ease of operation, increased generous range and capacity, plus the basic Precision that is SIP—to finish critically sensitive jobs like this so fast and so well! SIP quality and precision cost you no more.



makes Precision Production Practical & Profitable

AMERICAN SIP CORPORATION

100 EAST 42nd STREET, NEW YORK 17, N. Y.



*and how's this for
Accuracy?*

**HOLE DIAMETERS HELD TO
+0.0004", -0**

**CENTER DISTANCES HELD TO
+0.00025", -0**

Since 1926 all SIP Machines delivered to U.S.A. and Canada have been calibrated in the INTERNATIONAL INCH (1" = 25.4 mm).

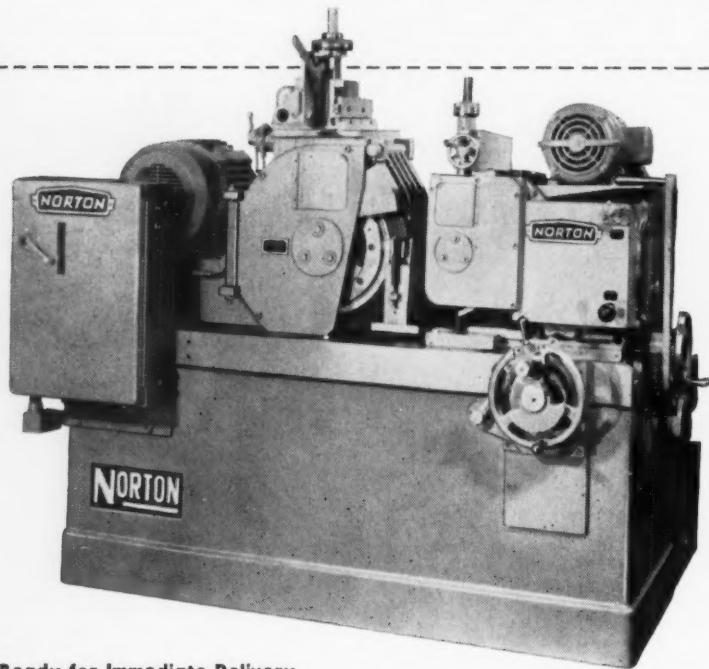
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Newest NORTON Grinder!

The No. 2 Straddle-Bearing



Centerless is built for speed...



Ready for Immediate Delivery

The new Norton No. 2 Centerless Grinder can be arranged for full automatic, semi-automatic or manual thru-feed or plunge grinding. Capacity includes work diameters ranging from $\frac{1}{16}$ " to $4\frac{3}{4}$ " depending on type of work rest and bar grinding fixture.

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

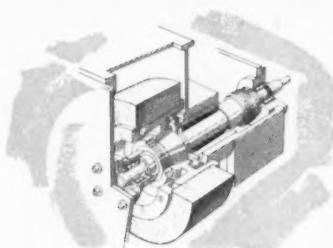
3 MAJOR ADVANCEMENTS IN CENTERLESS GRINDING

accuracy...economy

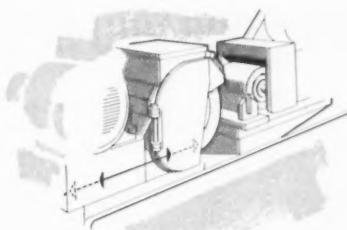
Like all Norton grinders and lappers the Norton No. 2 *Straddle-Bearing* Centerless Grinder is built to deliver "Touch of Gold" performance — the Norton extra that adds value to your product while cutting your production costs.

You'll find plenty of proof of that in the modern construction of this newest machine of its type. *Straddle* support of spindle bearings adds strength and ability to take tough jobs . . . the mobile wheel head and constant work-loading alignment make jobs shorter and easier.

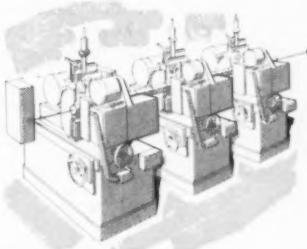
Many other features result in outstanding performance advantages. Call your Norton Sales Engineer, a trained expert in the grinding field, for consultation on how these features can benefit your production. Or write for Catalog 1328. NORTON COMPANY, Machine Division, Worcester 6, Mass.



Straddle-Bearing Spindle Support, in both grinding and regulating wheels, provides extra strength. Combined with the inherent rigidity of Norton spindles this boosts capacity to take heaviest cutting pressures, while permitting fast grinding to close tolerances under all conditions.



Mobile Grinding Wheel Head, with wheel mounted between head ways and feed screw located beneath wheel center for ideal balance, provides instant response to signals. This results in especially fast sizing, one of many important advantages over fixed head operation.



Work Loading Alignment is never disturbed by wear of either grinding or regulating wheel . . . neither is the alignment of the work rest blade. Movable heads for both grinding and regulating wheels make this advantage possible . . . and especially time-saving in a battery set-up.

NORTON

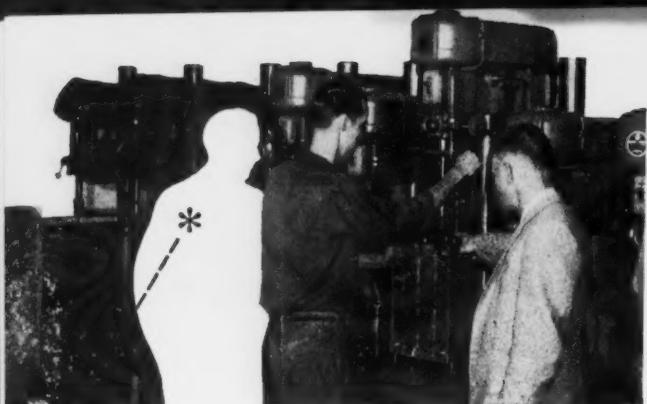
GRINDERS and LAPERS

District Offices:
Worcester, Hartford, Cleveland, Chicago, Detroit
In Canada:
J. H. Ryder Machinery Co. Ltd., Toronto 5

For more data circle 381 on Postpaid Card

September, 1959

modern machine shop 83



* YOUR W-T DEALER— the plus value you get with...

Your Walker-Turner dealer is a good man to know better. On his staff are specially-trained men who know metalworking from "A" to "Z"—men who have the experience and ability to assist you with any tooling problem you might have. And these metalworking experts are ready, willing and able to provide complete, engineered set-ups to best meet your specific needs.

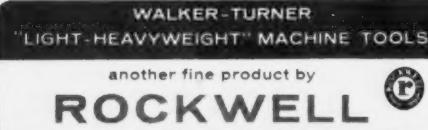
There are other reasons to call on your Walker-Turner dealer when you're in the market for metalworking tools. He offers a full line of rugged, versatile, low-cost W-T "Light-Heavyweights" that have proved their superiority in plants all over the country—he maintains a large inventory of new machines and spare parts—and his entire organization is built to give fast, personalized service (otherwise he wouldn't be a W-T dealer).

If you haven't as yet experienced the benefits of doing business with your Walker-Turner dealer, why not give him a call soon. He's listed under "Tools" in your classified telephone book.

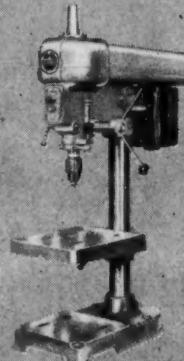


FREE CATALOG

Write to Walker-Turner Division, Rockwell
Manufacturing Company, Dept. WJ-22,
400 N. Lexington Ave., Pittsburgh 8, Pa.



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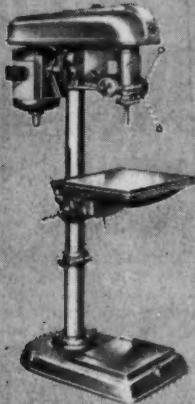
15" Drill Press



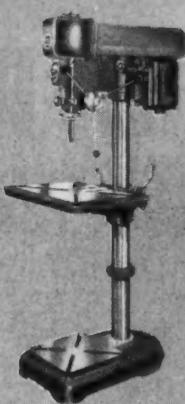
14" 8-Speed Band Saw



6" Bench Grinder



17" Drill Press



20" Drill Press



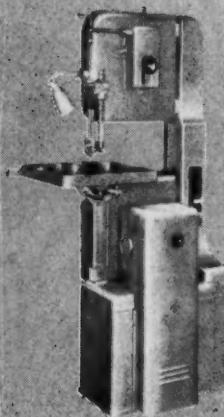
Radial Drill



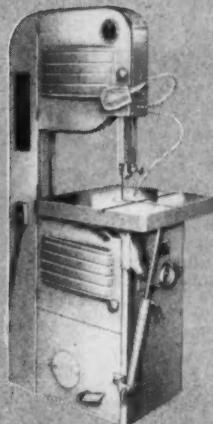
Cut-off Machines

T
URNER

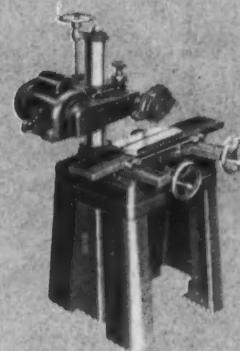
"LIGHT-HEAVYWEIGHT" **MACHINE TOOLS**



14" Variable Speed Band Saw



20" Variable Speed Band Saw



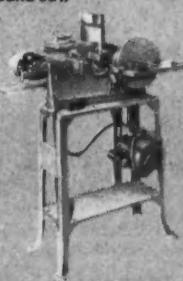
Surface Grinder



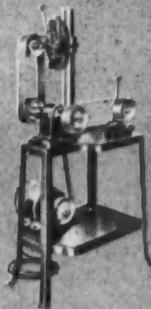
6" Tool Grinder



7" Standard Grinder

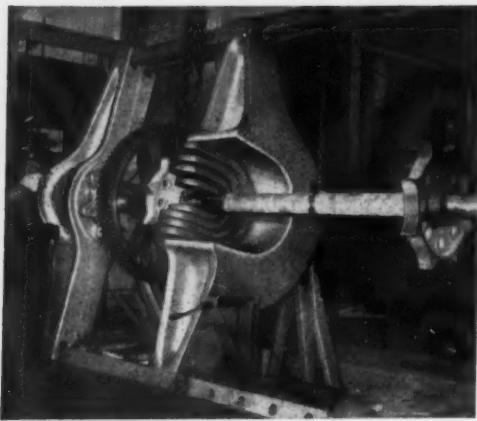


Belt and Disc Sander



2 1/2" Belt Grinder

A MOUNTAIN of POWER



POWER FOR BIG JOBS — Here a Rodgers 600-Ton Inclined Forcing Press is forcing a large gear and sprocket from a mine machine shaft.

— or a touch of pressure

The heavy machines and equipment used in the great iron mining industry present a variety of problems when repair or maintenance is necessary. For this work the accurately controlled action of Rodgers Hydraulic Forcing Presses is a real time and work saver.

A Rodgers Forcing Press puts a mountain of power at your fingertips to force wheels, sprockets or gears from their shafts and for straightening, assembling, swaging or upsetting jobs. Operators also use the versatility, speed, power and positive control of a Rodgers Forcing Press to efficiently perform small pressing and forcing jobs with just a touch of pressure—tasks once done only on vertical shop presses!

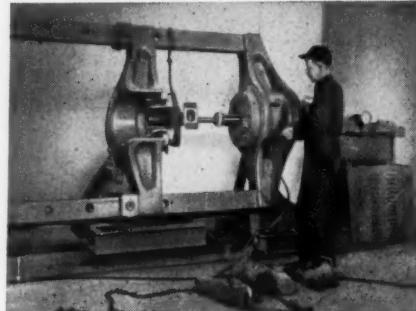
you get both with RODGERS FORCING PRESSES

Rodgers vertical, horizontal and inclined forcing presses offer capacities from 100 to 600 tons . . . up to 9 feet between tension bars . . . up to 16 feet between ram and abutment . . . single or double acting cylinders with 13 or 26-inch ram travel (72-inch travel available) . . . electrically powered hydraulic pumps with selective, positive pressure adjustment and remote control . . . removable press cylinders that can be used in special jacking or pulling jobs . . . and many more features that assure you of dependable, long life operation — all fully described in Rodgers Catalog Number 315A.



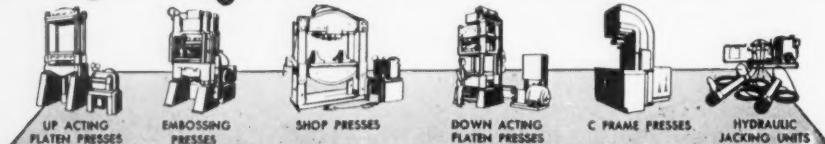
Write for it today!

Rodgers Hydraulic Inc.



LIGHT TOUCH FOR SMALL JOBS — This Rodgers 300-Ton Inclined Forcing Press is used on small as well as large equipment repairs. Here, a pin is being pressed out of a tractor idler support bracket.

7447 Walker Street • Minneapolis 26, Minnesota



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A PRODUCT

OF SKILL

BUTTERFIELD

BUTTERFIELD
100%
INSPECTED
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reamers, drills, taps, dies, counterbores,
cutters, end mills, hobs and carbide tools
in quantity when and where you want
them. Warehouses in Chicago, Cleveland,
Detroit, Fort Worth, Los Angeles, New
York and San Francisco.

Call your Butterfield Distributor.

BUTTERFIELD

BUTTERFIELD DIVISION,
UNION TWIST DRILL COMPANY, DERBY LINE, VERMONT

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September, 1959

modern machine shop 87

Hand stoning cutting tools



Master machinists know that hand stoning with INDIA® and HARD ARKANSAS Oilstones pays off in faster cutting action, keener edges, and longer tool life.

FREE: Send to Dept. MS-9 for the Hand Stoning Handbook filled with helpful hints on sharpening, radiusing, chamfering, deburring, and fitting intricate parts.



BEHR-MANNING CO.
TROY, NEW YORK
A DIVISION OF NORTON COMPANY



BEHR MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals

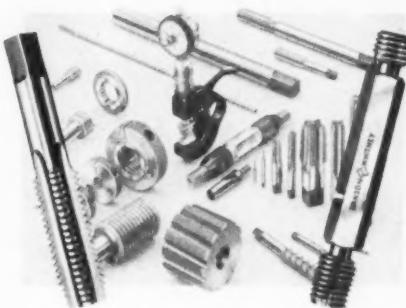
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Fact:

What you want are more quality threads per cutting tool dollar — not cheaper tools. Hanson-Whitney's *complete* line of standard taps, gages and cutters give you just that — complete uncompromising quality. *What you want* is consistent production with "free-cutting" action tools — not production variables. Consistent quality of Hanson-Whitney's standard tools reduce costly variations which can affect your profit dollar.

Complete and Related "STANDARDS"

What you want is a single source for standard threading tools and gages. It's *fact*, not fiction, that your Hanson-Whitney distributor is the single source for these *quality tools*. *What you want* is a source for complete and related threading service. Your Hanson-Whitney distributor is the threading specialist providing these services — backed up by Hanson-Whitney's forty years of thread engineering and experience.



Hanson-Whitney

COMPANY

205AC BARTHOLOMEW AVE., HARTFORD, CONN.

STANDARD: Taps • Thread Gages • Cutters • Fine Pitch Gear Hobs

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September, 1959

modern machine shop 89



announces

L-100-M

SPEED-BAND

a new concept in
band saw blades

From Capewell's famous Research and Development Laboratory comes the announcement of an important new metalworking development—Speed-Band

Speed-Band is the first band saw blade to be produced from a new alloy specifically designed for band saw blades.

Speed-Band is made from a double carbide alloy formulated to deliver optimum performance by embodying those characteristics most needed for economic sawing.

Speed-Band's double carbide alloy provides the hot hardness and abrasion resistance which permit use at higher speeds and feeds on standard carbon band saw machines.

Speed-Band's hot hardness and abrasion resistance increases the range and types of materials which can be cut on standard carbon band saw cutoff machines.

Speed-Band's hot hardness and abrasion resistance qualities guarantee faster cutting and greater productivity.

Speed-Band's exclusive features greatly extend blade life, reduce blade changing and down time, and minimize tool risk.

Speed-Band is the first band saw ever to be designed and developed with the user and the end use in mind. The genuine Speed-Band is manufactured only by the Capewell Mfg. Co., and sold only through authorized Capewell Distributors.

THE CAPEWELL MFG. CO., HARTFORD 2, CONN.



CAPEWELL L-100-M
DOUBLE CARBIDE PART-BAND

Special note to buyers of capital equipment:

Speed-Band's greater potential on standard equipment can eliminate the need for expensive special machinery.

Speed-Band's increased performance potential allows standard carbon band saw machines to be operated to their full capability for the first time.

Speed-Band's flexibility permits its use on machines designed for high speed bands, and where applicable, can reduce tool cost substantially.

Before you buy, see your Capewell Distributor for all the details on Speed-Band, the sensible band saw.



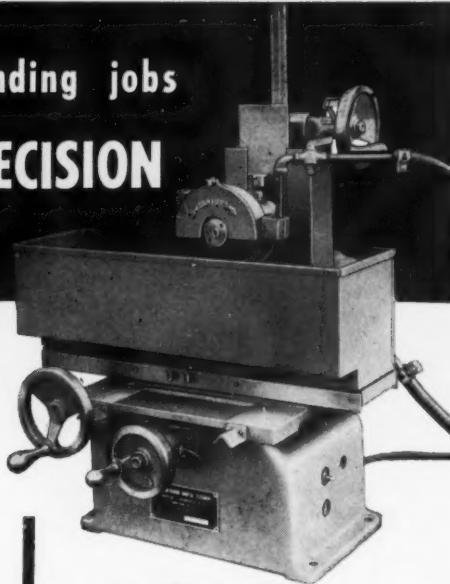
to do small grinding jobs
to **MICRO-PRECISION**
FAST...

**you need
the
SANFORD
Model SG
SURFACE GRINDER**

This unrivalled small parts grinder can be depended upon for micro accuracy. It's easy to use too . . . every hand wheel and operating switch is at your finger tips.

Designed and built by engineers and tool makers of rare foresight for tool, die and gage work, it has been constantly preferred after these many years of proven worth.

Write for fully illustrated literature, replacement parts and special attachments data with price list.



**For WET or DRY
grinding, specify
optional equipment.**

PARTIAL SPECIFICATIONS —

Chuck Surface—3" x 5" or 4" x 6".
Table travel—8", traverse 4".
Vertical head movement—6".
Work area under 4" wheel—6",
with chuck—4".

Standard grinding wheel—
4" x $\frac{3}{8}$ " x $\frac{1}{2}$ ".

Spindle speed—approx. 5500 RPM.
Motor, 1/6 HP, single or 3 ph.,
dynamically balanced.

Dimensions—23" x 30" x 27" high.
Net wt. approx. 160 lbs.

Representatives in major industrial areas

SANFORD MANUFACTURING CORP.
1022 Commerce Ave., Union, N. J.

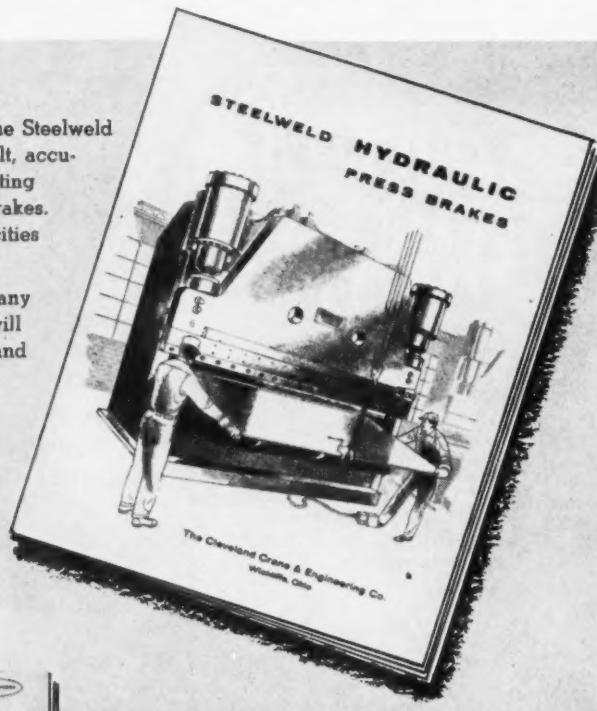
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**HYDRAULIC
PRESS BRAKE CATALOG**

Get the facts on the Steelweld Line of quality-built, accurate, smooth-operating Hydraulic Press Brakes. Available in capacities to 2000 tons.

Learn about the many fine features that will speed production and cut your costs.

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No. 2024*



MECHANICAL PRESS BRAKES

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STEELWELD
Mechanical and Hydraulic
PRESS BRAKES

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

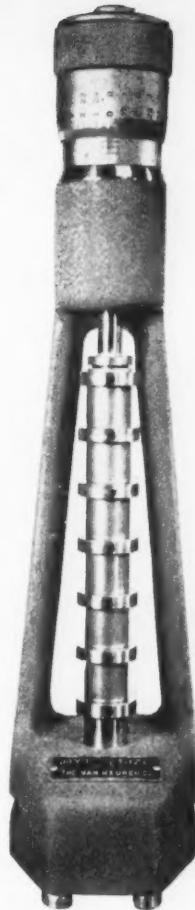
**THE CLEVELAND CRANE & ENGINEERING CO.
6476 EAST 281st STREET • WICKLIFFE, OHIO**
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NEW VAN KEUREN HYT SIZE GAGE

- it embodies the well-known *Van Keuren precision*.
- it has a decided price advantage.
- permits amazing speed in setting all dimensions (a matter of a few seconds!)
- it's accurate to .000050" over entire range.
- has exclusive design features: a patented spring-loaded non-rotating spindle eliminates backlash . . . measuring surfaces are accessible from front and back . . . it can be used in a horizontal position.
- it's ruggedly built for long life.
- easily portable . . . can be used anywhere in shop.

HYT Size Gage, 10" model

Available accessories:
18" transfer gage
3" and 6" riser blocks



PAT. NO. 2,713,208

Now you can more quickly inspect drill jigs, lathe fixtures, gears, cams, splines, profiles, contours . . . and check many shop operations. You can easily set precision depths on drill presses, milling machines, jig borers, etc.

Write today for descriptive bulletin.



THE *Van Keuren* CO.
Since 1920

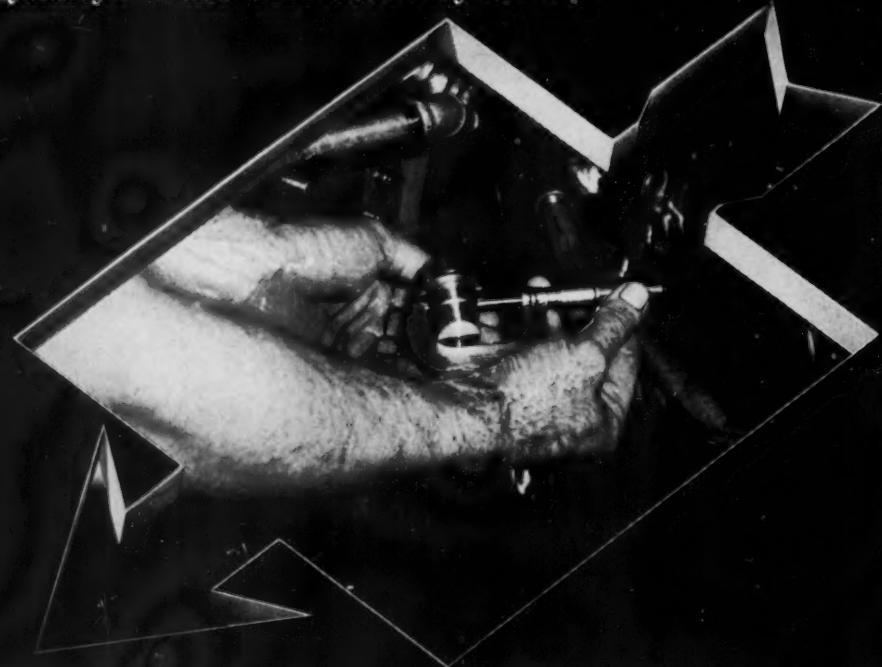
175 Waltham Street, Watertown 72, Mass.

PRECISION MEASURING TOOLS
... rated the world's most accurate

Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts

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Quality . . . the best economy of all



He does a better job when he can see what he's doing

You increase operator efficiency as well as production when you use transparent, heavy-duty Sunicut cutting oils. Operators work better, because Sunicut oils let them see tools and workpieces, see the finish, see micrometer graduations.

Sunicut oils don't stain hands and clothing. They pump easily, wet metal fast, and give excellent extreme-pressure lubrication.

To prove to yourself the economy of Sun quality, ask your Sun representative to help you select the right

grade of Sunicut for your heavy-duty cutting requirements. Or write to **SUN OIL COMPANY**, Dept. MM-9, Philadelphia 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.



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Broaden Your Abrasive
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Improve Your Product Quality

The Only Complete, Comprehensive STOCK LINE of MULTI-USE, SOFT RUBBER BONDED ABRASIVES!

Discover the many new applications modern Brightboy offers you to replace older, costlier metalworking methods! The specially-compounded abrasives and rubber in versatile Brightboy work simultaneously to produce

A UNIQUE ACTION!

A Refreshingly New, Wider Concept
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STOCK NUMBERS JOB-MATCHED TO
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Wheels • Sticks • Rods • Blocks
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largely eliminate the necessity for special
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Silicon Carbide and Aluminum Oxide
grains, grades extra fine to extra coarse,
in soft, firm and tough rubber binders.

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- SAMPLE HAND TABLET
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BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.

95 North 13th Street • Newark 7, N. J.

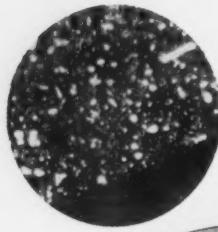
America's Pioneer Manufacturer of Rubber-Bonded
Abrasives

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September, 1959

modern machine shop 95

Foremost Toolmakers Approve Sentry Hardening



Visit Booth 1719

41st Metal Show, Chicago, Nov. 2-6

LOOK into some of America's leading tool rooms to learn how to make your production tools the finest! You'll find that many of the foremost hardeners entrust their precious high speed tools only to the Sentry Diamond Block method of atmosphere control.

The reason why? Sentry hardening is sure. Valuable tools of any steel hardening above 1700°F. can be fully hardened without danger of scale or decarburization. Surface spoilage is positively eliminated.

*A demonstration of hardening on your own tools will
convince you of Sentry benefits. Why not send us samples?*



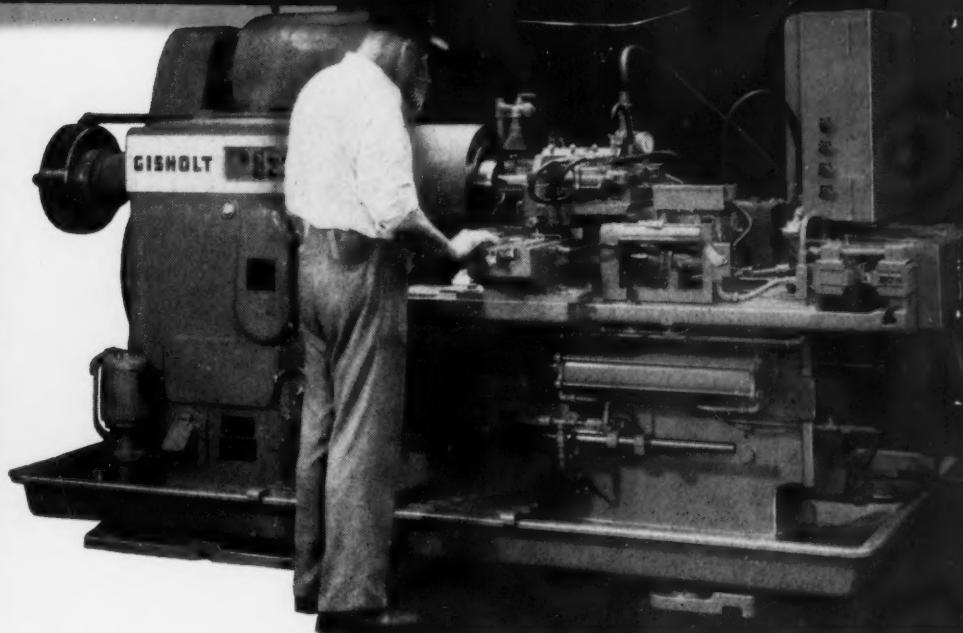
Sentry

TRADEMARK

ELECTRIC FURNACES

Request Catalog P-12 • Write THE SENTRY CO., FOXBORO, MASS.

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HOW 8 SIMPLIMATICS cut machine time 50% cut man hours 75%

The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic

design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.



In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation. One man can easily tend two machines.



Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.

GISHOLT MACHINE COMPANY, Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY-REBUILT MACHINES WITH NEW MACHINE GUARANTEE

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Save Hours in tool rooms and die shops with CONTOUR SAWING AND FILING

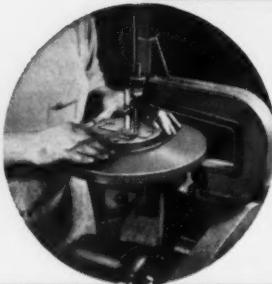


You can save real time and money in the production of parts for jigs and fixtures, dies, gages, templates and special machine production by using an Oliver of Adrian contour sawing and filing machine.

The Oliver is so simple to operate that all sawing, filing and lapping can be handled by an ordinary mechanic—saving a skilled die maker's costly time. Parts can be shaped to dimension faster, more accurately with no hand filing or semi-finishing operations. Available in five types—bench or pedestal. Write today.

OLIVER of ADRIAN
OLIVER INSTRUMENT COMPANY

1430 E. Maumee St. • Adrian, Michigan



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NOW 7* STANDARD LAPMASTERS

FOR PRECISION LAPPING

to a flatness of .0000116" or less with a micro-inch finish of 2 to 3 RMS. All Lapmasters will maintain this uniform accuracy piece-after-piece because conditioning rings continually condition the lap plate during entire lapping cycle.

IN SMALL LOTS OR THOUSANDS PER DAY

with consistent accuracy. Production is not interrupted or slowed down for replacing or reconditioning lap plates.

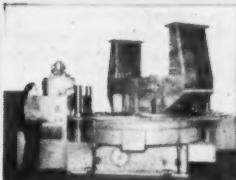
OF PARTS UP TO 32" DIA.

and as small as $\frac{1}{2}$ " dia. Accurately laps paper-thin pieces as well as giant two-ton parts.

OF ANY SHAPE, FORM OR MATERIAL

tall or squat, long or short, flat or odd shaped... any metal, ceramics or plastic all at the same time if necessary. Inexpensive work holders eliminate danger of stresses and warping usually caused by clamping during grinding or milling.

*For your special lapping requirements, we will build Lapmasters any size.



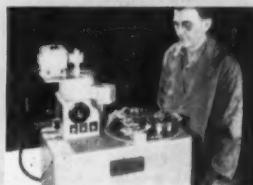
MODEL 84 for parts up to 32" dia.



MODEL 73 for parts up to 27" dia.



MODEL 10 for maintenance lapping of parts up to 3-11/16" dia.



MODEL 12 for parts up to 4" dia.



MODEL 24 for parts up to 9-1/2" dia.



MODEL 36 for parts up to 14-1/2" dia.



MODEL 48 for parts up to 17" dia.

WRITE FOR THE COMPLETE LAPMASTER STORY
Write for bulletins describing the Lapmaster line and chart on measuring flatness.



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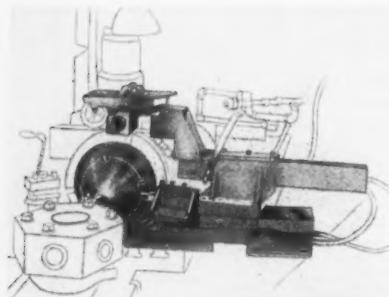
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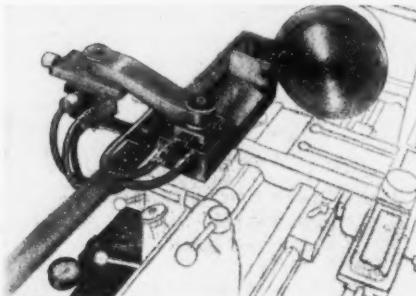
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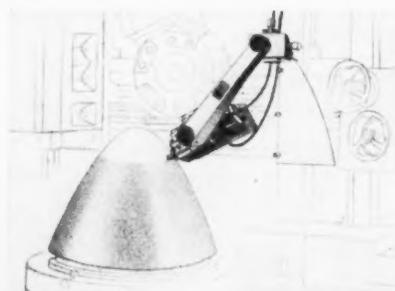
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modern machine shop 100a



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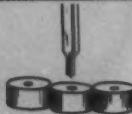
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New 8 page catalog lets you choose from more than 500 standard and stocked precision punches and dies

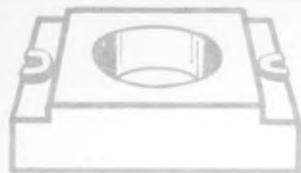
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You are assured of accurate hole location with Di-Acro Precision Punch and Die sets because the centering point on the punch is ground concentric to the cutting edges, there is no "slop" even when several holes are punched in a blank. Hole sizes are accurate due both to the high degree of concentricity of the punch and die set and the choice of clearance which allows the user to obtain clean, burr free holes no matter what material thickness is to be perforated.

All Di-Acro punches and dies are precision made of high quality tool steel. A number of die-holders and die adapters are available so that the Punches and Dies can be adapted to most hand and foot presses and many power presses. Punch holders quickly convert punches for press use with rams having 1", 1 $\frac{1}{2}$ ", 1-9/16" and 2" holes.

For your convenience, factory stocks are now available and several dealers now stock Di-Acro precision punches, dies and accessories. Consult the yellow pages of your phone book under Machinery-Machine Tools for the name of your nearest Di-Acro distributor.

Di-Acro is pronounced die-ack-ro. It is the registered brand name for both hand and power operated Di-Acro Benders, Brakes, Notchers, Press Brakes, Punch Presses, Rod Parters, Rollers, Shears and Spring Winders made in the U.S.A. by O'Neil-Irwin Mfg. Co., Lake City, Minn.

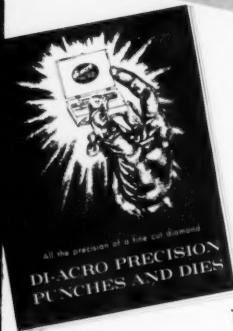


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Fred W. Vogel

Over the Editor's Desk

BUILDING-BLOCK STANDARD

For both the manufacturer as well as the user of the transfer type production machine tools, the news this past month that agreement on a limited series of standard specifications had been reached by a number of manufacturing firms and tool suppliers was good news indeed. The agreement follows four years of study and negotiation among various user groups and tool suppliers to formulate standards that do not restrict machine tool builders but will aid firms in reducing the obsolescence cost of expensive special-purpose equipment.

Henry C. Daum, manager of Ford Motor Company's machining process department and chairman of an industry committee, reports that only a limited number of standard specifications have been included and there is no intention to dictate design features to machine tool builders.

The "building-block" concept, in practice, permits replacement of one or more sections of a production line with other standard sections to adapt the basic line to production of newly designed parts. This concept evolved from the joint efforts

of Ford Motor Company, General Motors Corporation, Chrysler Corporation and International Harvester, beginning in 1955. The program later was endorsed by other high and low volume companies.

The presently approved package incorporates specifications for production equipment that were carefully reviewed, individually and collectively, with nearly all major machine tool supplier companies.

Until recently, it appeared that automation with its enormous investment in equipment might tend to freeze design in the automobile industry. The large transfer machines in use, particularly those for machining large components, have been highly specialized and difficult to adapt to changes in model and part design.

The "building-block" or "unitized automation" should encourage incorporation of technological advancements and product design changes which benefit the buying public since the flexibility of equipment will make the changes less costly.

The "building-block" concept also appears to be the answer to extending the automatic production line into new areas of industrial

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Over the Editor's Desk . . .

use, since purchase of the new equipment will be more economically practical for smaller companies.

Anyone interested in the new manufacturing standards may obtain a copy entitled "Production Machine Tools, Components and Units" by writing directly to Mr. Henry C. Daum, Ford Motor Company, The American Road, Dearborn, Michigan.

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PERHAPS PEACE TOO

With the knowledge and experience of recent months which clearly accentuated the up-and-down trend of business activity, it may be well at this time to check with the experts to see how they feel about the future. The following represent some rather optimistic observations on the outlook for business that were suggested by Standard & Poor's Corporation, one of the largest statistical and investment advisory service organizations in the world. These observations seem to summarize, in a very concise fashion, the principal factors which are generally conceded to be very important in the continuing growth of the American economy.

These factors point to expansion:

1. The explosive growth of population—from 173 million in 1958 to 210 million by 1969.
2. Fast increase in the number of new families, and the rising birthrate—possibly more than 5 million births a year by 1969.
3. Increasing movement of people to new locations, requiring new homes, new furnishings, new automobiles, new public utilities of all kinds.
4. A power-laden expansion of discretionary spending power—up from \$140 billion in 1958 to an estimated \$265 billion in 1969.
5. A financially sound national economy which provides increasing amounts of credit for industry, government and the private consumer, giving double assurance of the nation's capacity to buy what industry can make.
6. Over and above all this, industry has built up a momentum in research and development that will rapidly revolutionize industrial processes, the pattern of consumer buying and the standard of living. From a few million dollars a year spent on industrial research and development in 1940, we are now headed for a gigantic \$10 billion a year.

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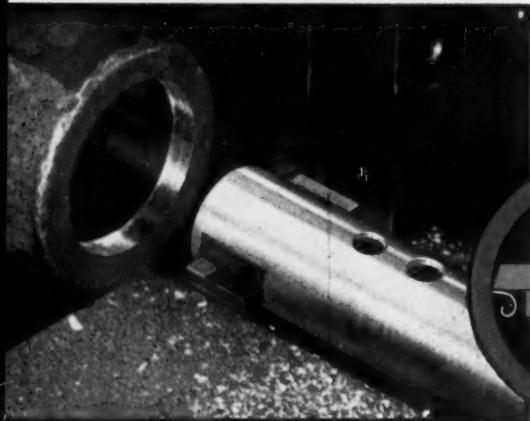
PERCENT OF COST

Historians of the future who look back at our day and age will be intrigued, we are quite sure, by the effect which the automobile had on our civilization. No less intrigued will be those who attempt to make a study of the manufacture of this mode of transportation.

Not content to wait for the future, however, is Dr. George S. Benson who recently sent to us the following item which is based upon the results of a recent study and one which we think will be of interest to many of the readers of these pages.

What would be your guess on this question: What is the labor cost in an automobile selling for \$2,000? Most people no doubt would guess the labor cost at 25 to 30 percent of

replaceable boring and reaming cutters



adjust
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hole!

Save 70% or more in tool costs and production time on holes over 5/8"

- Diameter adjustable within $\frac{1}{4}$ in. range: Blades are expandable as they wear for maximum tool life and accurate tolerance control. Grind blades for tolerance only; not for size.
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- Cut tool inventory: One Madison slotted bar can be used on holes of many varied diameters...since each bar accommodates a broad range of cutter sizes.
- No alignment problem: Madison reamer blades float in the bar slot...are self-

centering in the hole. No floating holders required, no compensation for spindle wear. (NOTE: Boring cutters are fixed in their slots...do not float.)

- Free cutting action, no chip pack-up: Generous chip clearance permits free circulation of coolant for higher speeds, finer finishes, closer tolerances.
- Multiple operations in one pass can be performed simply by spacing standard Madison blades on specially made bars. Any combination of reaming, boring, chamfering and other hole-making jobs can be completed on a variety of diameters...and in one pass!

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Over the Editor's Desk . . .

the selling price. A few might guess as high as 50 percent. Actually, after direct and indirect taxes are deducted, labor costs amount to approximately 80 percent in the selling price of a new car. And that's about what it amounts to in any manufactured product—80 percent.

If wage raises come as a result of increased productivity, because of improved machine tools, manufacturing techniques and worker efficiency, then the consumers as well as the workers have a chance to benefit. In this situation prices can be lowered or quality and service improved—or both. If wage raises, on the other hand, are not based on increased productivity then the price of the products manufactured goes up. And when prices go up, the very people who got the wage raises soon find that their dollars are not buying as much as they previously did, so they begin thinking about another raise.

This is the process of leapfrogging—wages going up, then prices going up, then wages going up again, and so on and on. The people who are not on industrial payrolls suffer to a greater degree than the wage earners, and the people on retirement or other fixed income are terrifically hard hit. This situation is out of character with the traditional American way of life which, for a century, has been producing more and more goods, of higher and higher quality, at lower and lower prices—thereby improving the living standard of all.

Recently we made a study of a \$2,000 automobile — to see what made it cost \$2,000. You'll no doubt

be surprised at what we found: It takes 4½ tons of coal, 2¾ tons of iron ore, 50 pounds of cotton, 14 pounds of finished wool, or synthetic materials, aluminum, zinc, lead, copper, and countless other raw materials to make an automobile. Without the addition of labor costs, these things are worth about \$22. But these raw materials require the labor of thousands of people in countless crafts to transform them into a finished car.

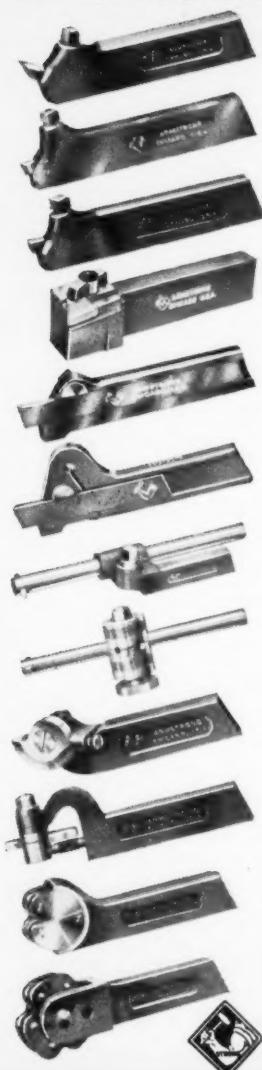
Miners dig the coal and iron ore; railroad and maritime workers transport these materials to the steel mill where other workers convert the ore into steel. Then fabricating plant workers come into the picture. The cotton accumulates labor cost when the farmer tills the soil; the workers sow the seed, and others cultivate and harvest the crop. Other workers transport it to the gin, others gin it, others transport it to the textile mills—and finally the cloth reaches the auto plant. When all of the parts and materials finally reach the factory for assembly, the labor cost of workers, of course, must be added to the price of the car.

In the \$2,000 automobile, taxes can be figured at about \$500. Direct and indirect labor costs add up to approximately \$1200 of the \$1500 balance—or 80 percent. And who gets the \$300? Raw material cost—\$22. Net profit to producers of raw materials and allied industries—\$89. To part manufacturer—\$47. To local dealer—\$77. To car manufacturer—\$65.

It's obvious that wage raises — unless offset by increased productivity — boost the prices of the things we buy—and tend to lower everybody's living standard.

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Machining Parts for Power Generators



Giant powermakers for the electric utility industry are built and designed in the three main buildings of General Electric Company's Large Steam Turbine-Generator Department shown here.

This article explains the application of unprecedented machine tools required in the manufacture of electric power generating equipment.

By **FRED W. VOGEL**
Editor, *Modern Machine Shop*

In any discussion of the progress being made by any huge corporation today, it would not be surprising for at least some person to volunteer the comment: "Well, they're big, they have plenty of money, they can afford to modernize, they can well afford to buy all the new tools and equipment they need." Such is the usual comment directed toward firms in the automotive field or the chemical or petroleum industries, or the communications and transportation systems, and perhaps particularly toward public and private utility organizations.

It would not be at all uncommon

to hear such comment leveled at the giant in the electric appliance, power, and related equipment field. But let's take a brief look at large scale metalworking operations in the plant of a large electrical equipment manufacturer, for example, to see if the problems, financial and otherwise, are very much different than those encountered in the medium size and even the small shop.

During recent months, the Large Steam Turbine-Generator Department of the General Electric Company at Schenectady has been engaged in unveiling a multi-million dollar array of automated machine tools which have been installed and

placed in operation by the department. The additions to already existing productive capacity, it is being clearly pointed out, came about only after the most thorough search into all aspects of the operations involved, particularly those points which would justify the expenditure of huge sums for new tools as replacements or for modernizing a production method or for the purpose of obtaining a greater amount of more accurately machined workpieces.

Reviewing some of the problems in the financial justification of capital expenditures, W. W. Kuyper, Manager of Manufacturing Engineering LST-G Department has this to say: "It is vital to the health of our business that we do an outstanding job of equipment selection and development. Only by doing so, can we meet our full obligations to the Electric Utility Industry, to the shareowners, to the men and women who work for GE, and to our community. Most directly, financial justification consists simply of forecasting the effects of a proposal on the cash flow of business and on the income account of the business. The income forecast shows the effect of the savings that are made, offset by costs, and of such increased business as is assured. The cash flow forecast shows as a function of time, the amount of risk and the time that it is at risk. It permits ready inclusion of such effects as work-in-process inventory changes.

"To this financial forecast, we must add the assurance that we have chosen the right plan, and that we propose to buy the tools that are best suited to the job. It is often easy to justify financially a second

best choice but the adoption of anything but the best choice will eventually weaken the business. Further, the equipment which is procured must be the best for the specific circumstances, not for idealized circumstances that do not exist."

So with this brief background glimpse at important planning considerations that confront every large corporation, we can now take a look

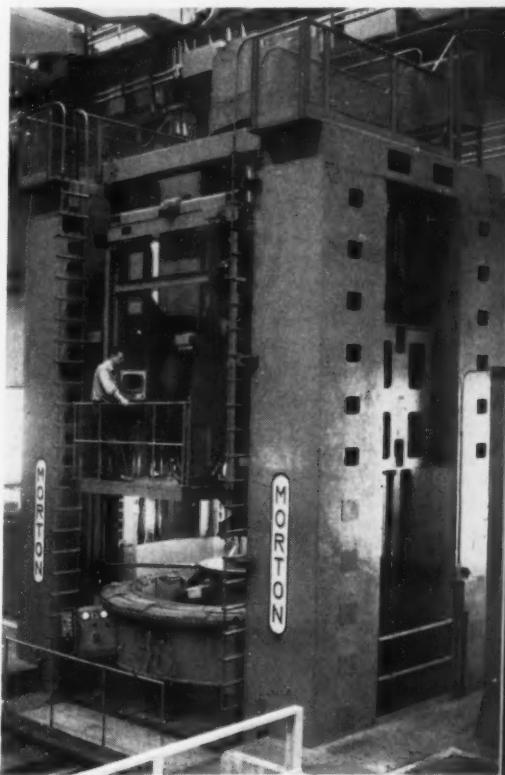


Fig. 1—Closed-circuit television gives the operator a view of the machining operations performed by this huge vertical boring and surfacing machine on high-pressure inner shells designed for large steam turbines.

"Parts eight feet in diameter can be machined."



Fig. 2—Operator prepares to lower cutting heads in vertical boring machine which bores and surfaces high-pressure inner shells for steam turbine-generator units. Cylinder under cutting heads is closed-circuit television camera which transmits picture of cutting to screen on operating bridge and enables operator to follow tool as far as 8 feet away.

at some results at a General Electric plant. In the following paragraphs are descriptions of several new machine tools in operation in the LST-G Department, tools which were selected as part of a multi-million dollar machine tool program designed to meet the anticipated upsurge in demand for huge electric power generating equipment.

Figure 1 shows a view of a new Morton vertical stub bar boring machine for machining both the inside and outside of 20-ton steam turbine inner casings. This machine is provided with a numerical positioning system, a novel visual indicator to keep the operator informed of tool motion and position through full-sized templates, as well as a

closed-circuit television system which monitors high-speed removal of metal.

Installed at a cost in excess of a million dollars, the boring machine is 43 feet high and is equipped with its own elevator to enable the operator to service it from the floor to the top of its towering columns.

The work table is 11 feet wide and 13 feet long. The workpiece remains stationary during machining operations. Parts eight feet in diameter and eight feet high can be machined.

Numerous electrical components are required to direct the machine. Nineteen motors from $\frac{1}{2}$ to 100 horsepower capacity and six variable-voltage drives are used. The largest is the power supply for the 100 h.p. main spindle drive motor.

A round body armored plug-in television camera is secured to the boring head and, together with a built-in light source, transmits a picture of cutting action and surface condition of the work to a screen on the operating bridge.

To load the machine, the bridge and quill assemblies are raised to the clear position and the work table is moved to its forward or load and unload position away from the machine. A crane loads the workpiece on the work table where it is accurately centered through a series of circular locator grooves machined in the table. It is rested on parallels and securely clamped to the table. Any piece up to 10 feet high will clear the machine throat when the power operated table is traversed to its work position. It is locked

against heavy positive stops set to insure accurate location of the work with respect to the center line of the spindle and of the turning ring.

When the table is in work position, a clearance hole through the center lines up with corresponding clearances in both the base and foundation. This allows chips produced during boring and facing to be cleared from the table and delivered automatically to scrap salvage bins beyond the work area.

When the workpiece is in position for machining, the bridge is lowered to its working position exactly parallel to both the work and the turning ring. The gaging as applied is set for 6-inch vertical increments. Complete interlock protection insures the correct selection of matched sets of blocks.

Four boring heads cover the range of 16 to 60 inches in diameter. Each boring head carries two gibbed toolholder slides, as shown in the close-up view Fig. 2. Electrical components of the numerical positioning system are direct connected to ball bearing screws to eliminate the possibility of signal error from any gear train backlash. The television camera is plugged in at the base of the head for viewing of the cutting action of one tool.

The visual indicator is located in the center of the bridge. This unit indicates tool position both vertically and radially with respect to interior of the workpiece. Full-size templates of the work cross section and the tool bit contour are secured to holders and are set to zero reference positions corresponding to the actual work and tools. Vertical motion to the tool template slide is through a direct connection to the

quill while radial out feed is accomplished with zero backlash drive powered by a selsyn drive from the boring head feed. The unit is particularly useful in machining around irregular contours which the operator is unable to see directly. It also minimizes down time which would be incurred to physically check the work.

All items which the operator must see or reach have been grouped on the power operated platform where his primary control devices are mounted. A light on the operator's control stand signals when the work feed is stopped and the operation is complete. He then selects proper equipment for the next machining step.

Touch a button and the new multiple-spindle tape-controlled machine shown in Fig. 3 starts to drill and ream more than 2,700 holes in massive generator rotors

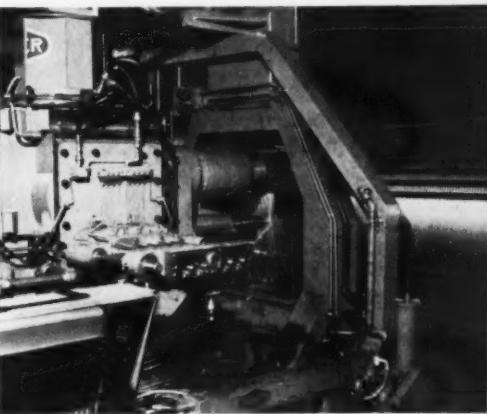


Fig. 3—Drilling, reaming, milling as many as 2700 holes in rotors up to 90 tons and 24 feet long for large steam turbine-generators is the task of this tape-controlled Baker Brothers machine. Holes can be drilled singly, as shown in this view, or five at a time.

"Some rotors require as many as 2,700 ventilating holes . . ."

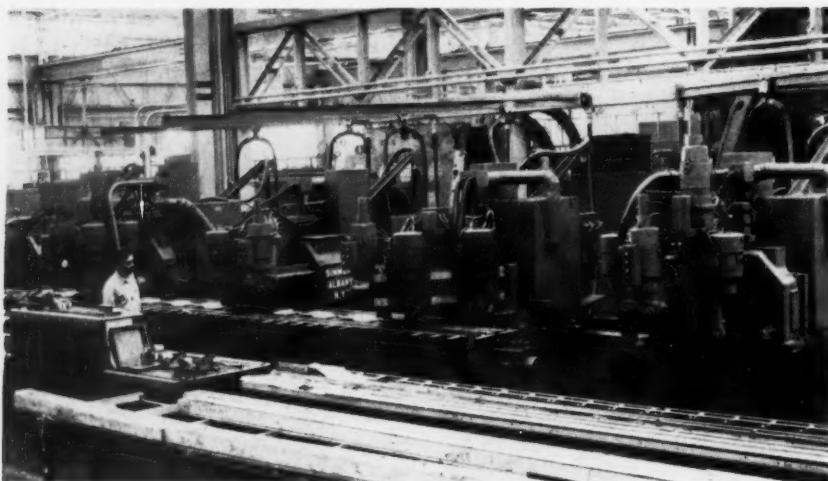


Fig. 4—Bank of cutting heads performs 250 operations on copper generator conductor bars.

weighing up to 90 tons and with lengths up to 24 feet.

The drilling machine has a four-faced turret, each with a removable head containing five spindles for drilling and reaming. From the time the first buttons are pushed by the operator, the punched tape reader controls the machine in the desired sequence of tapping, drilling or slot milling.

Manufactured by Baker Brothers, Inc., of Toledo, Ohio, the 28-foot long drilling machine has its turret mounted on a carriage which travels laterally on a slide. The machine can be adjusted to accommodate rotors from 30 to 64 inches in diameter. The spindles can take drills up to $1\frac{3}{4}$ inches in diameter and drill holes to a depth of 12 inches.

Some rotors require as many as 2,700 ventilating holes, three

inches deep. Multiple holes are drilled in a line based on uniform spacing but these uniform spacings may be skipped as the longitudinal motion is completely controlled by selsyn measurement from punched tape. The tape indicates when tools should be removed and when groups of holes are to be skipped, or when an individual hole is to be drilled which is not in the normal multiple sequence. On an individual, single-hole basis any longitudinal spacing may be obtained.

To drill one hole at a time, the center spindle only is supplied with a tool and the necessary guide bushing. In addition, one turret face may be equipped with single-spindle tapping head so that when required, holes may be tapped.

It is also possible to remove the drilling heads and mount, on one of

the faces of the turret, a vertical slide which will accommodate a multiple-spindle head to allow for tangential milling of slots. Gearing in the turret provides 30-h.p. outputs available at each face. The spindle speed is variable over a four to one range by a direct current motor whose speed is set by means of the tape. Hydraulic feed speed of the vertical slide is likewise set by the tape.

All operations of the machine are performed automatically. When the tape function has directed the carriage to its location on the bed, the tape signals the opening of the valves to the hydraulic cylinders which provide lateral motion to the turret slide which in turn furnishes the feed of the tools into the work. A tape function also causes the turret slide to retract the tool from the workpiece.

Tape control is used for the longitudinal spacings and automatically furnishes coded information on the tools to be removed and index to the required turret face.

The carriage has a travel of 24 feet and will position anywhere in thousandths. Traverse is at 290 inches a minute and positioning at 36 inches a minute. The rotor is supported in bronze half shells on pedestals. In addition, one journal support can be adjusted longitudinally to accommodate the difference in lengths of rotors.

This machine performs operations formerly accomplished with standard radial drills and horizontal boring machines. Costing approximately \$500,000 to build and install, it is anticipated the new facility will handle current production with one and one-half shifts per day, and

anticipated increased production with three shifts per day.

An unique application of automation to a job shop is found in the new generator conductor bar milling machine shown in Fig. 4 which performs 250 operations on generator conductor bars for large steam turbine-generator units. Built by the Simmons Company of Albany, N. Y., the new machine tool is completely card-controlled by two reader card controls through the console to main control panel.

Both the rib section and the cover

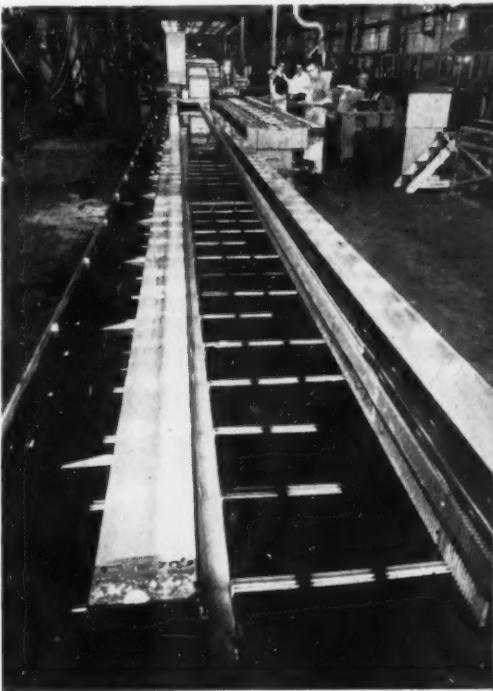


Fig. 5—Overhead lights are reflected in the oil pan of a machine which is designed to perform 250 operations in the manufacture of copper conductor bars for generators for large steam turbine-generator units.

"Six heads perform approximately 250 operations . . ."

section of hollow conductor bars are arranged parallel on the ways and are machined at the same time. Each bar averages 19 feet in length, is 1 $\frac{3}{4}$ inches wide and about 5/16th inch thick and made of copper. When the machining operations are completed, the bars are joined by end sections which are brazed on to form a rectangular channel for conductor cooling of generators.

Six heads, controlled electrically, hydraulically and mechanically, perform the approximately 250 operations on the bars. Head No. 1 contains a wire brush and actuates clamps to hold the material being worked. The brush cleans the sur-

face and removes burrs. Head No. 2 puts in slugs for blocking passages and welds them in place. Each bar requires about 26 slugs which are automatically fed from a hopper to the head. Head No. 3 is a dual operation, cutting front side ports and back end tapers. Heads Nos. 4 and 5 make 45-degree cuts, both on the right and on the left side of each bar. Head No. 6 is for deribbing or channel widening. It also makes the end cutoff and prepares the bars for brazing.

The operations are card programmed from special drawings. Machine operators, of which there will be two on each of three shifts,



Fig. 6—Bucket for steam turbine-generator unit is examined by R. H. Wilke, right, General Electric specialist, machine tool development, and by H. R. Durham, Ex-Cell-O profile miller.



Fig. 7—Cutting head at left on profile miller shapes more efficient buckets for large steam turbines. Over 5,000 buckets, such as one on machine, are used in typical large steam turbine-generator unit for production of electric power. Three-dimensional milling cutter goes completely around bucket, cutting it to dimensions for final grinding and polishing.

will set up and check their own work.

The machine's ways, a portion of which are shown in Fig. 5, are 90 feet long, 8 feet wide and have a work table 32 feet long. Using carbide cutters, the machine requires about 45 minutes to complete operations on a rib and cover. Approximately 250 to 300 bars are used in each generator for a large steam turbine-generator unit. Cutters are preset before the insertion in the spindles. The operators change cutting edges after completion of about 80 bars.

The clamps which hold the work-piece are automatically actuated by air through the use of special arms attached to spindles to make absolutely sure that the cutters do not

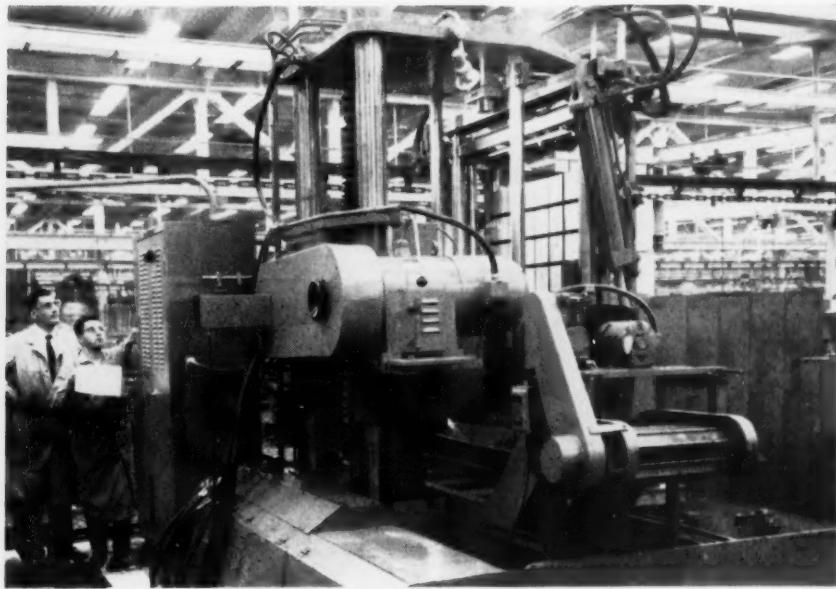


Fig. 8—One of the smaller new machine tools is this tape-controlled, high-speed, single-spindle horizontal drilling machine capable of drilling 8 to 10 inches per minute through 10-inch plate.

"... data taken from blueprints is transferred to punch cards."



Fig. 9—Row after row of holes, from 100 to 2,000 to a plate are produced by tape-controlled, high speed, single-spindle horizontal drilling machine shown herewith.

run into the steel clamps during matching operations.

Lubrication is circulating constantly and oil flows back through the bed. It is changed every two months and reprocessed in the plant. Oil capacity is 250 gallons.

Steam turbine buckets, whose tip speed is faster than sound, are being milled to the most efficient contours ever attained through use of the new tape-controlled machine shown in Fig. 6. Built by the Ex-Cell-O Corporation, this new numerically controlled profiling machine is designed to handle turbine buckets with overall length up to 72 inches and vane length of 60 inches with a maximum width of 12 inches. This new type of miller does three-dimensional machining in a full circle around the turbine buckets, prepar-

ing them for final grinding and polishing.

The development and application of this new manufacturing technique enables engineers to have freedom to design the most efficient shapes of buckets for large steam turbine-generators. New designs can be put into production in a matter of days. Thus engineers will have more freedom to change designs by not being forced to wait three to four months for preparation of a three-dimensional master.

In preparation of the tape which controls the machine, data taken from blueprints is transferred to punched cards. These, with a program deck are run through an IBM 704 computer and a half-inch wide magnetic tape is obtained. This is fed into an electronic director which interpolates and transforms the digital data information on velocity, time and directions on a 1-inch magnetic tape. This one-inch tape, with its continuous tool path information, operates through the machine's control system to direct the machine.

In setting up the workpiece, the operator uses a blank forging which has locating points machined on it. The surface of the vane is cut to dimensions required. The root of the bucket is later milled in another operation.

The machine has a base mounted longitudinal table for the headstock and tailstock between which the workpiece is clucked. As shown in Fig. 7, roller supports back up the workpiece against thrust of the cutter. Another slide at right angles

holds the cutter head. Initially the cutter is set at a predetermined place relative to the center line of the bucket and the work table is preset relative to the center line of the machine. The cutter moves in and out to conform to the desired shape as the workpiece traverses past it during successively indexed strokes. An average of three turbine-generator buckets can be milled on one cutter change.

Once the operator presses the starting button the tape-controlled system takes over and he has no further operations to perform on the machine except in an emergency or to change cutters, or put on a fresh piece of stock.

Row after row of holes, from 100 to 2,000 to a plate, are drilled by means of the numerically-controlled, high-speed, single-spindle horizontal drilling machine shown in illustration Figure 8.

The new machine, built by Walter

P. Hill, Inc., is for use in the drilling of tube sheets and tube supports for coolers used in generators. The single spindle, shown in the close-up view Fig. 9, uses a 1½ inch drill maximum or 7/16 inch minimum and runs at speeds of 1,200 to 1,800 r.p.m., depending upon thickness of the material. It drills holes in single plates as thin as $\frac{3}{8}$ inch, or in stacks as thick as 10 inches, at speeds of 8 to 10 inches per minute. Steel, brass and bronze plates are drilled. In addition to drilling, the machine, as directed by punched tape, also performs reaming and chamfering operations on workpieces.

Each cooler unit has an average of seven plates and a generator may have as many as eight coolers, thus requiring as many as 56 plates for a generator. Plates are either circular or rectangles with a maximum diameter of about four feet or about two feet square. Some require as few as 100 holes and others from

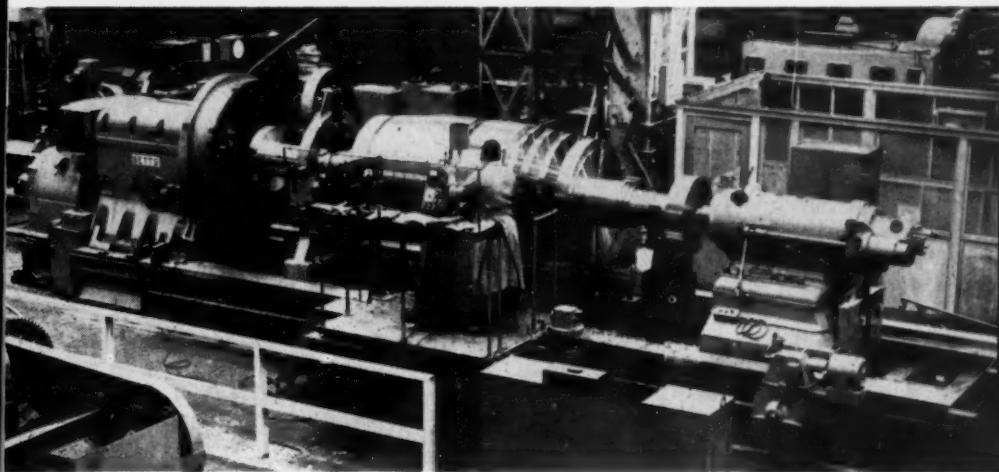


Fig. 10—This huge turbine rotor, shown here being grooved with the aid of Carbolyt disposable type inserts, weighs approximately 34 tons and is 19 feet between lathe centers.

"... **turbine rotors must be grooved to various depths . . .**"

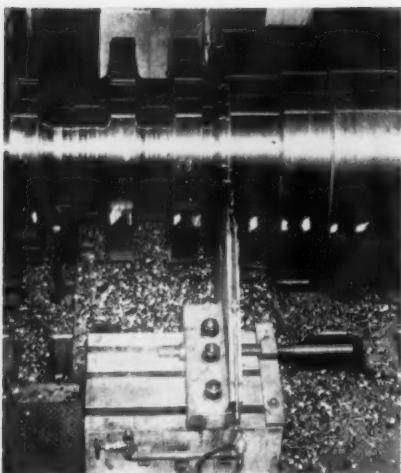


Fig. 11—The single-head toolholder on rear of lathe overlaps dual-head front toolholder to allow for cutting 2-inch wide groove.

1,700 to 2,000 holes in each plate.

Drilling speed is 8 to 10 inches per minute and carriage movement is 84 inches a minute or about 1½ seconds between holes. Chips are removed automatically by a conveyor which drops them into a chip bucket for disposal.

The machine has a tilting table controlled by hydraulic cylinders. The work is clamped on the slotted table, and a push-button operation causes the hydraulic cylinders to raise the table into vertical position. The table is automatically locked by a hydraulic cylinder-controlled pin mechanism. Then the part is programmed automatically through an entire drilling sequence.

Three independent hydraulic systems are provided on the machine.

One system is used for the table drive, the second system for the vertical head drive, and the third system for the drill feed and table tilt functions.

The setup work is done by the operator with the aid of a jib crane to assist in loading plates on the work table and to move the plates to the tapping or burring machine. The operator installs the tape, starts the machine and the drilling sequence continues while he taps or burrs previously drilled plates on other machines located in his particular work area.

The machine is 15 feet long, 8 feet wide and 10 feet high. It is equipped with a four-foot fixture plate and both hydraulic and selsyn controls.

A spectacular illustration of the value of cemented carbide disposable tooling is provided on the Betts special grooving lathe shown in Fig. 10. The big Betts lathe is used for grooving turbine rotors ranging up to 20 feet in length, up to 52 inches in diameter, and weighing up to 40 tons. The turbine rotors must be grooved to various depths, as shown in illustration Fig. 11, often through areas where test holes (or "coupon" holes, 2 inches in diameter and 5 inches deep) have been previously drilled.

Initially, a series of brazed-on Carboloy inserts in solid holders was adopted. There was an immediate increase in production, with a corresponding decrease in tool costs. The experiment with Grade 370 carbide was so successful that a wider area appeared for cost savings.

With the cooperation of the Metallurgical Products Department of General Electric and LST-G's machine tool development engineers, a design study was made with the aim of applying disposable insert cemented carbide tools. First step was the design of a temporary type toolholder—now made permanent. This toolholder uses the same size and grade of bit as the single rear tool. This desirable arrangement has cut the stockpiling of brazed-on grooving tools and has meant an additional saving.

There are other advantages to the disposable inserts. Tool changing time is cut to a minimum and the high cost of stocking various standard and special types of solid tools is eliminated. Costs of tipping, regrinding and rebraze are high compared with the economy in servicing the disposable inserts. The disposable insert holders provide the additional advantages of rapid, easy and accurate replacement of cutting edges. As fast as new toolholders can be designed and made, all grooving will be switched over to the disposable type tooling.

★ modern machine shop ★

American Standard for Reamers. A newly revised American Standard for Reamers has been approved by the American Standards Association and published by The American Society of Mechanical Engineers. Designated B5.14-1959, the revision covers nomenclature, definitions, types, sizes, and tolerances for reamers. Following a comprehensive glossary of reamer terms, there are tables of tolerances

and general dimensions for 37 types of reamers.

The principal revisions are in the areas of nomenclature and the addition of standards for a greatly extended series of high speed steel straight shank reamers. The nomenclature has been revised to conform to that used in the revised standards for other metal cutting tools such as twist drills, milling cutters and taps. Minor changes have been made in tables of sizes and types, as well as in tolerances of various elements, to reflect current requirements in their field.

American Standard for Reamers, ASA B5.14-1959, is available at \$2.50 a copy from The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, New York, or from the American Standards Association, 70 East 45th Street, New York 17, New York.



High Speed Grinding of Printed Circuits

Burrough's plant uses abrasive belt equipment to surface both sides of copper-clad printed circuit boards.

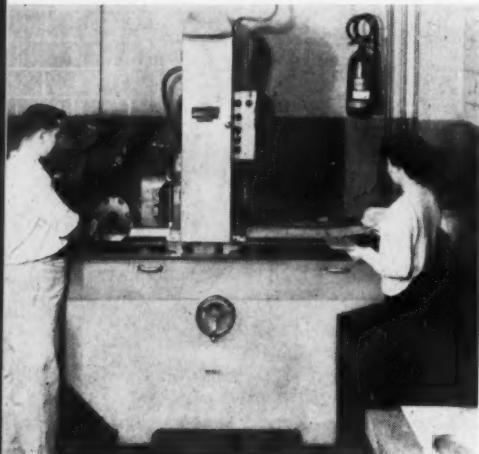
By BARTLETT WEST

At the Tireman plant of Burrough Corporation's Military Electronic Computer Division, Detroit, Michigan, a high-speed abrasive belt grinder is used to

surface both sides of copper-clad phenolic or epoxy sheets. The machine, a single-head Model 1092 conveyor-type grinder, is a product of Engelberg, Inc., Syracuse, N. Y.

The laminated sheets, which range in size from $3\frac{1}{2}$ by 5 inches to 16 by 16 inches and from $1/16$ to $3/32$ inch in thickness, are used in the manufacture of printed circuit boards, an integral component of complex electronic equipment built by Burroughs for business and defense. Among products employing printed circuit boards are the ground guidance computer for the mighty Atlas intercontinental ballistic missile and data processing systems for SAGE, continental air defense network. In addition, they are used in advanced electronic accounting machines and in desk-size computers with scores of business, scientific and engineering applications.

These laminated sheets are drilled with a series of holes for subsequent mounting of electronic components or for conducting circuits from one



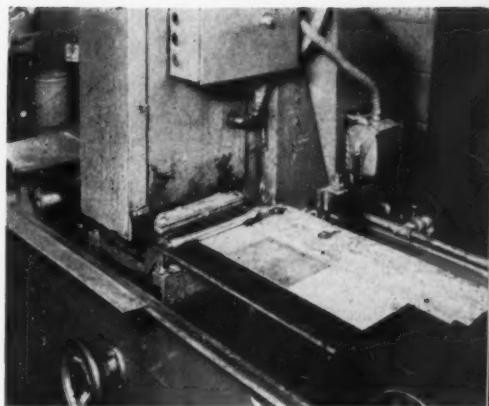
Copper-clad phenolic or epoxy sheets are loaded by operator at right on conveyor belt. A single pass is required on each side of panel to remove conductive material. Some 40,000 circuit boards are ground each month.

side of the board to the other. A conductive material is then applied to both sides of the boards to provide conduction through the holes for subsequent electroplating. This material must be removed from surfaces of the boards because of the processing that follows. The Engelberg Model 1092, a key unit of Tireman's printed circuit fabrication facilities, is used to remove this conductive material.

Formerly, the circuit boards were processed by a small belt sander. Production was slow and much of the work had to be completed by hand. Now, with the Engelberg abrasive belt grinder, more than 40,000 circuit boards are processed each month.

The machine operator places the boards on the machine's conveyor belt (11 by 144 inches) which carries the parts under the grinding head. Another operator stationed at the other end of the machine unloads parts as they move to the end of the conveyor belt. Conveyor feed rates, ranging from 2 to 25 f.p.m., vary with the size of the part being processed. When one side has been surfaced, the parts are fed through the machine for another pass on the opposite side. In the processing of larger sheets, 16 by 16 inches for example, one side must be processed twice because the machine's capacity is 10 inches. One half of the sheet is ground in one pass and a second pass is taken to grind the other half of the sheet.

Removal of the conductive material is a precision grinding process. Depth of cut is regulated by a micrometer adjustment of the grinding head; excessive removal would take off the copper foil. This oper-



Special hold-down rolls insure positive feed under grinding head. A 180 grit silicon carbide abrasive belt is used in conjunction with Rustlick B9J coolant in grinding work.

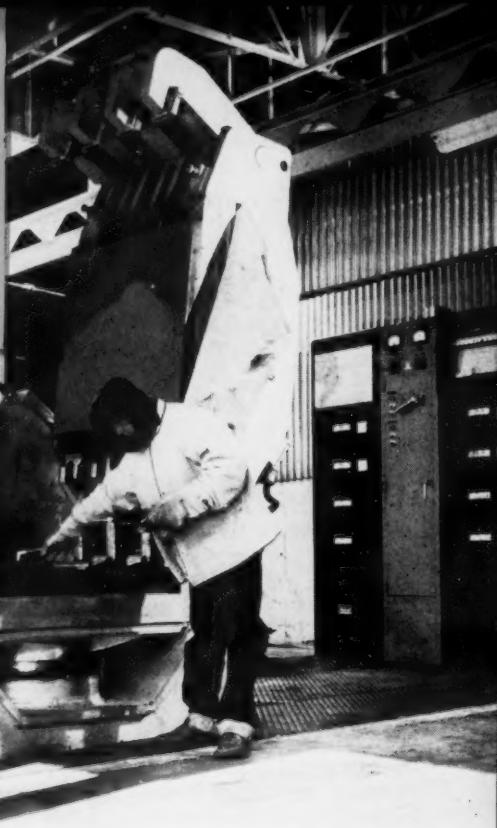
ation removes approximately 0.25 milligram of conductive material per square inch.

Size of the 180-grit silicon carbide abrasive belt is 10 by 92 inches and abrasive belt speed is 5,500 s. f. p. m. The abrasive belt is backed up by a 6-inch diameter, 10 to 20 durometer, rubber-covered contact wheel with 45-degree serrations. The softness of the rubber contact wheel permits the abrasive belt to conform with surface irregularities during grinding. Special hold-down rolls mounted on either side of the grinding head provide positive through-feed of sheets under grinding head.

The machine's self-contained coolant system applies coolant—Rustlick B9J—directly to the work area and also sprays it forcibly across the full width of the abrasive and conveyor belt. Belt life varies with the size of panel being processed. Average belt life with a 9 by 9 inch panel is 500 circuit boards completely ground on both sides.

HOT-SIZING

A Remedy For Space-Age Wrinkles



Sheridan-Gray hot-sizing presses in use at North American Aviation. Side-by-side location permits presses to be used together on larger parts or separately on smaller parts.

**Process permits difficult-to-work alloys to be
finish-formed faster and more economically
without post-process warpage.**

By GILBERT C. CLOSE
Field Editor, Modern Machine Shop

Advent of the Space Age brought some sizable problems with it. From the standpoint of the shop man, many of these problems are extremely "down to earth" and infinitely distant from the interstellar orbits of the vehicles they are

helping to build. One of the major problems deals with precision forming of the many light but strong sheet metal components which go into these space vehicles, into the somewhat less spectacular terrestrial missiles, and into the now rather

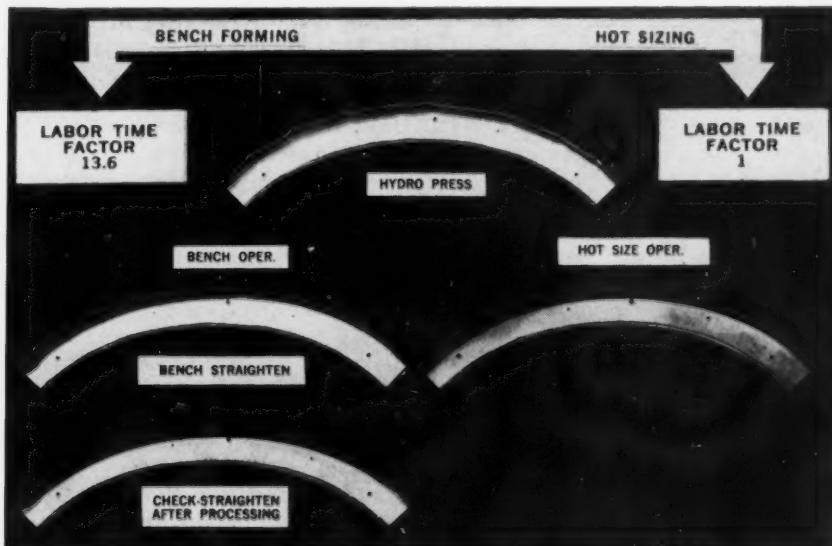
mundane jet airplanes which loiter through the stratosphere at speeds which just barely exceed the speed of sound.

Most of these sheet metal components are now being formed from one of the titanium or stainless steel alloys—materials of great strength, high heat resistance, and a very good strength-to-weight ratio . . . but all of them extremely difficult to precision form. They are first given a rough shape in a hydropress or drop hammer, usually with several inter-stage heat treatments to keep them in a workable condition. This is followed by hours of bench hand work to iron out flange wrinkles, adjust joggles, and finish-work the flats. Final heat treatment usually employs a bi-metal restraining jig which, because of the difference in coefficient of expansion

between its bi-metal components, confines the part in its laboriously hand-wrought form during this stress-relieving cycle.

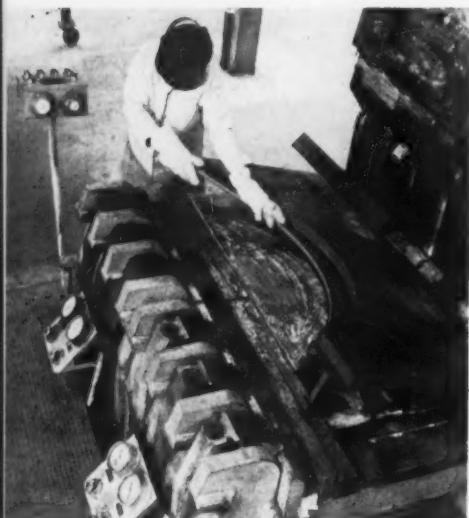
Needless to say, and because of the many uncontrollable factors involved, rejection mortality is extremely high in this type of work. Nor can full advantage be taken of the inherent metallurgical characteristics of the material. Controlled metal flow during initial forming on a drop hammer or hydropress is difficult to obtain, and this situation is not improved during subsequent cold bench work. Minimum radii are extremely difficult to form.

In addition to the above disadvantages, the current techniques used in forming these parts are extremely time-consuming and tooling costs are high. When all is added together, final cost of the part soars



This illustration shows the labor savings realized in forming a typical titanium part.

"... hot-sizing presses have many advantages . . ."



Close-up view showing an operator removing a hot-sized part from a hot-sizing press.

somewhere near the orbit of the vehicle which will subsequently carry it aloft.

Several years ago, metallurgical engineers at North American Aviation decided there must be a faster and more economical way to accomplish the desired results. They grasped at an idea as old as the art of metal forming itself . . . confinement of the metal at an elevated temperature and under sufficient pressure to cause it to flow smoothly around the particular forming dies that are being used.

Keeping this theory firmly in mind, development work on a prototype hot-sizing press was started. It was decided from the first that rough forming in a hydropress or a

drop hammer would be necessary to minimize confinement problems in the hot-sizing press itself. The hot-sizing press would then accept the rough-formed part, heat it, confine it and then apply sufficient pressure to movable female die sections so that the confining space would be restricted, and during this restriction the heated metal would flow smoothly around and accurately conform to the male section of the die being used.

The prototype hot-sizing press worked so well that others were built, and a patent is pending on the design. Meanwhile Sheridan-Gray, Inc., Torrance, California, has been licensed to produce these hot-sizing presses on a commercial basis. The commercial presses are now being used by several manufacturing companies, including the McDonnell Aircraft Company, St. Louis, Missouri, and the Production Heat Treating Company, North Hollywood, California.

The hot-sizing presses have now been in use long enough to definitely establish the many advantages that accrue when used in conjunction with the "space age" alloys which are so difficult to form by conventional methods. Chief among these advantages is the fact that in a great many cases results can be achieved which cannot be readily achieved by any other forming technique.

In addition, it has been proved that by hot-sizing, these parts can be finish-formed in approximately 8 percent of the time required by older methods. Only 1/12th the

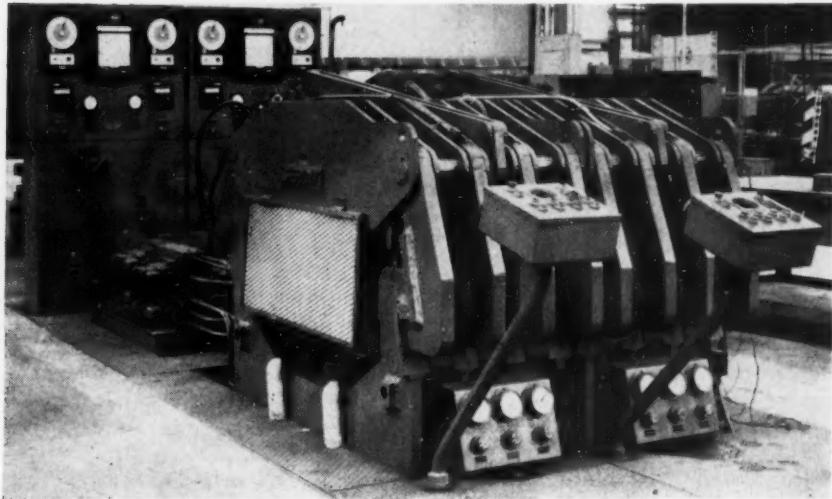
"Hot-sizing permits induction of uniform stresses . . ."

labor is required. Approximately 99 percent of check and straightening operations is eliminated. Hot-sizing permits induction of uniform stresses throughout the parts as they are processed, thus eliminating post-process warpage.

Tooling costs are drastically reduced. In many cases the male die used on the hydropress or drop hammer to rough-form the parts can be transferred to the hot-sizing press and used for final forming. And die construction is simplified because the dies can be produced to conform to the finished size of the part without allowances for springback or shrinkage. Another big savings results because the need for the costly bi-metal dies normally employed during stress relieving heat treatments is entirely eliminated.

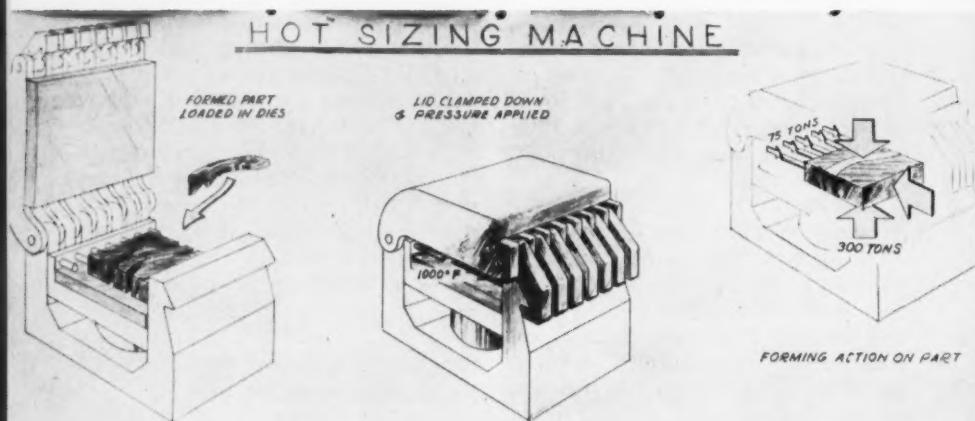
The construction and operation of the hot-sizing presses are fundamentally simple. As shown in the accompanying illustrations, each press is of hinged-lid construction, with the electrically heated hot platens folded between the lid and base like the pages of a book. Both dies and work are placed on the base platen, then the lid is folded down onto it. Toggles located on the lid engage heavy lugs provided on the front of the base to hold it firmly in place when pressure is applied during press operation.

Horizontal rams on the front and back of the press are then actuated and press against the movable or female sections of the forming die and press them against the flange sections of the work at 75 tons pressure. Then a vertical cylinder



Latest Sheridan-Gray hot-sizing presses installed in North American Aviation Columbus plant.

"... fire-resistant hydraulic fluid is used in the cylinders . . ."



This illustration provides a diagrammatic description of how hot-sizing presses operate.

beneath the base platen presses upward at a maximum pressure of 300 tons, forcing it upward against the lid.

It is thus quite evident that all pressures are being exerted directly on the work, forcing it into exact conformity with the dies. These pressures are maintained for a predetermined time varying between 5 and 10 minutes, dependent on the gauge thickness of the material and the severity of the forming operation required. The press lid is then raised and the finished work is removed from the press. Because of the even distribution of internal stresses obtained during the hot-sizing operation, the work is normally allowed to cool to room temperature without restraint of any kind, resulting in a high quality structural part minus deformity of any type.

Operation of the press (that is,

raising and lowering of the lid and actuation of the pressure cylinders) is brought to a focal point in a small console type control panel. The maximum operating temperature of the hot-sizing press is 1,800 degrees Fahrenheit.

The hydraulic system is made as leakproof as possible. Because of the heat, a fire-resistant hydraulic fluid is used in the cylinders and lines. The seals, valves, and pumps used are made resistant to the fluid medium involved. A rifle-drilled steel manifold block equipped with flange-mounted valves eliminates the need for many connecting lines and fittings.

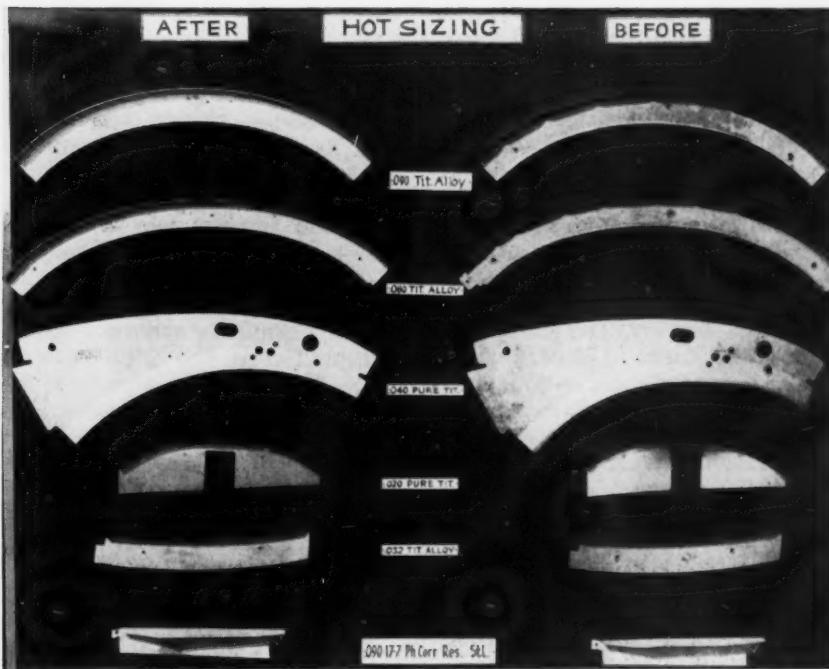
When required, two or more of these hot-sizing presses can be mounted side-by-side, thus increasing the size of the work that can be handled. In such an arrangement, the hot-sizing presses may be used either together or singly as desired.

Material up to 0.093 inch in thickness and as thin as 0.005 inch has been successfully hot-sized. Accuracy of the hot-sizing operation is usually more than adequate. While tolerances on these "hard to form" alloy parts are usually specified within 1/32 inch, size tolerances of the finished part down to 0.003 inch can be obtained.

In the commercial versions of the hot-sizing press designed to date by Sheridan-Gray, platen sizes have ranged from 24 by 24 inches on 100-ton models to 48 by 48 inches on 1,000-ton models. The temperatures that have been used have ranged between 1200 and 1800 degrees F.



Before hot-sizing press was available, "space ally" parts had to be stress relieved after final hand forming in a costly bi-metal jig.



Typical "before and after" shots of same parts. "Before" shows how part appeared when it came out of hydropress or drop hammer. "After" shows same part looked after hot-sizing.

How To Set a

Author discusses several important factors to be remembered in setting this comparator type gage to a master.

By DOUGLAS C. CUNNINGHAM
Standard Gage Company, Incorporated

A dial bore gage is a comparator type gage and it must be "set" to some surface with a known dimension which is called a "master." The master can be cylindrical, similar to the bore to be checked, or it can be two flat surfaces which are parallel to each other and accurately spaced to a given dimension.

In "setting" a dial bore gage to a cylindrical master there are a number of important things to remember, as follows:

(1) You must know the *exact* size of the master ring. The AGD gage-makers' tolerance classifications "XX", "X", "Y", and so on, are not adequate for jobs involving "tenth" tolerances. Note allowable manufacturing tolerances for master



rings, as listed in the accompanying table. The master ring should be calibrated and the exact size indicated on it. This practice parallels the similar practice of periodic calibration of gage blocks and is even more important in the case of master rings.

(2) The gaging surfaces of the master ring and the gage must be free of all minute scratches, nicks, dust, and so on.

(3) The gage should be set to the master ring while the ring is in a position similar to the workpiece. If the axis of the workpiece is vertical,

STANDARD TOLERANCES FOR MASTER RINGS (all "minus")

SIZE		CLASS XX	CLASS X	CLASS Y	CLASS Z
ABOVE	INCLUDING				
.029	.825	.00002	.00004	.00007	.00010
.825	1.510	.00003	.00006	.00009	.00012
1.510	2.510	.00004	.00008	.00012	.00016
2.510	4.510	.00005	.00010	.00015	.00020
4.510	6.510	.000065	.00013	.00019	.00025

then the axis of the master ring should be vertical; if the work axis is horizontal, then the ring axis should also be horizontal.

(4) As the bore gage is rocked back and forth in the master ring, you should pay particular attention to the high point of the sweep reading in both directions. Any difference in indicator reading when rocking the bore gage back and forth usually indicates excessive wear either in the gage head or on the O.D. of the gaging plunger in the gage head.

(5) "First-piece" masters are often used on short run jobs. This practice consists of using the first production part as a master for the balance of the short run. Every precaution should be taken in establishing the exact size and geometric accuracy of this sample part with the same care and accuracy as is normally required to calibrate a master ring.

(6) There is *no* substitute for a "XX" ring on very close production tolerances. Also, for dial bore gage "setting" below 1 inch a ring master is definitely preferred. It is customary to take 10 percent of the workpiece tolerance and, by reference to the AGD tolerance table shown herewith, determine the tolerance "class" of the master required for setting the dial bore gage.

The practice of "setting" a dial bore gage to flat surfaces instead of a ring involves other very necessary precautions, as pointed out in the following paragraphs:

(1) The customary use of stacked gage blocks demands first quality blocks of known calibration. "Jo" blocks must be "wrung" together

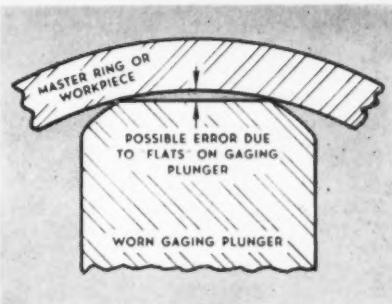


Fig. 1—Any flats on gaging surfaces of dial bore gage will cause an error in setting.

and held in some type of device with protruding top and bottom plates for actual "setting."

(2) Hoke blocks must be carefully assembled with the usual accessories provided for that purpose and clamped with proper pressure. Note—either type of master block must be free of surface irregularities, dirt and body temperature distorting heat.

(3) Ordinary micrometers may also be used to set dial bore gages. Obviously the accuracy obtained by such a "setting" depends upon several factors: (a) accuracy of micrometer vernier calibrations, (b) the operator's skill and judgment in reading "tenth" verniers, and (c) the parallelism of spindle and anvil faces. An accumulation of these three factors can easily produce a "tenth" or more error in the setting of a bore gage.

(4) Any dial bore gage "set" between parallel flat surfaces must have gage points free from wear. Any "flats" on the gaging surfaces will cause an error in "setting" (roughly equal to twice the height of the chordal segment produced by

"Setting a dial bore gage requires practice . . ."

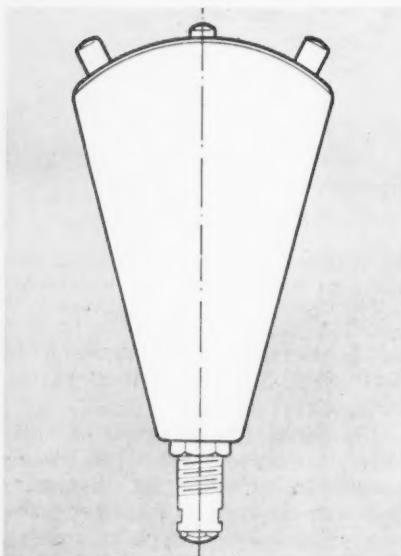


Fig. 2—The gaging plunger and opposite gage contact of dial bore gage head must be in line on a common axis, as shown herewith.

the radius of the bore and the width of the flat on the gaging point), as shown in Fig. 1. Maximum wear resistant material on the gage points is good insurance against this error and will more than make up for the nominal extra charge for the better material. Standard's stock Norbide, tungsten carbide, or diamond tipped gage points are good examples of the better materials which should be used. "Setting" a dial bore gage to a micrometer or gage block flats requires some practice and skill in establishing a gaging contact axis in two right angle planes at one time. This constitutes a justified time-consuming criticism against these

methods of setting a dial bore gage.

(5) The gaging plunger and opposite gage contact of dial bore gage head must be "in-line" on a common axis, as shown in Fig. 2. Any deviation will result in a triangulation effect and its resultant error in comparison of two flat master surfaces as against a cylindrical master. The dial bore gage should be checked carefully to see if worn threads in the range extension or worn threads in the corresponding tapped hole in the gage head are causing any misalignment of the gaging points. Be sure that the proper range extension is being used to assure adequate thread engagement between the range extension and the head of the gage.



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September, 1959



A CASE HISTORY—

Machining Stainless Steel

Change of drill grind minimizes burr formation and increases tool life in drilling

Type 302 stainless tubing.

By G. J. STEVENS

Machining Engineer, Armco Steel Corporation

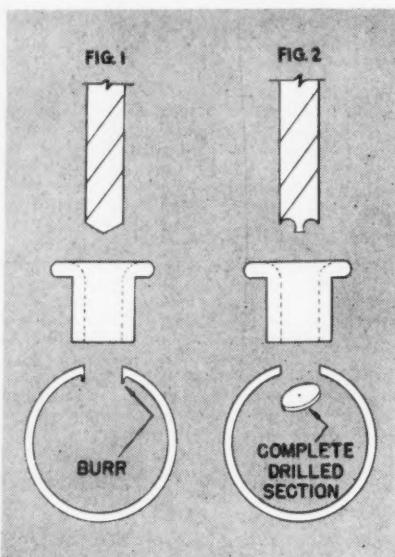
Problem:

A shop was drilling a series of $\frac{3}{8}$ -inch diameter holes in Type 302 stainless steel tubing to be used in a filter element assembly. When using a drill with conventional type grind on a drill press, difficulty was experienced when the drill broke through the wall of the tubing. This break-through caused the drill to jam and also left a large burr inside the tube, as shown in Fig. 1 of the accompanying sketch. A secondary operation was then necessary in order to ream the tubing, which was a very time-consuming and costly operation.

Solution:

By providing the drill with a sheet metal grind (see Fig. 2 of the sketch) which produces a center pilot and duplicates a fly-cutting action, drilling torque was reduced considerably and the burring problem was greatly minimized. In addition, this type of grind prevented the drill from jamming, which alleviat-

ed the problem of holding the drill fixture to the drill press table. Drill life also was very greatly improved.



Sketch shows how change of drill grind eliminates burring problem in drilling $\frac{3}{8}$ -inch diameter holes in Type 302 stainless tubing.

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Vacuum Probe Solves Problem In Milling Airframe Parts

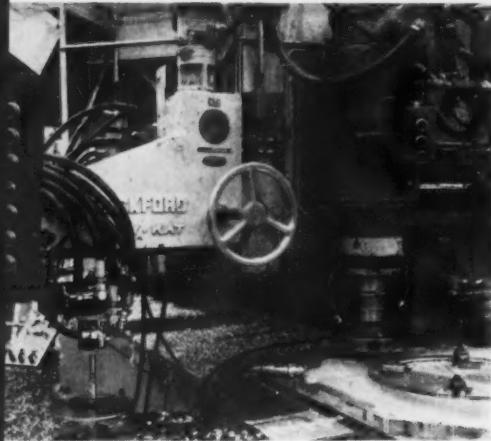
PROBLEM: How to take full advantage of benefits offered by vacuum clamping and still meet industrial safety requirements. **ANSWER:** A simple plug-on warning device which monitors vacuum clamping force applied to parts during machining cycle.

By H. F. ROBINSON
Facilities Engineer, Long Beach Division,
Douglas Aircraft Company, Inc.

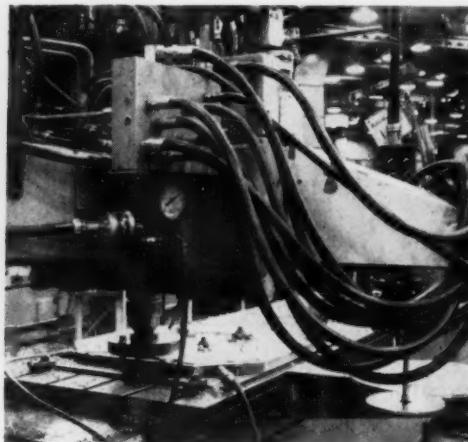
The most likely applications of vacuum clamping are not necessarily the most profitable. Ordinarily, one would imagine the greatest payoff to be in milling large wing skins and fuselage panels. On the contrary, we have found that sizable

gains can be realized in milling applications involving small and medium sized parts.

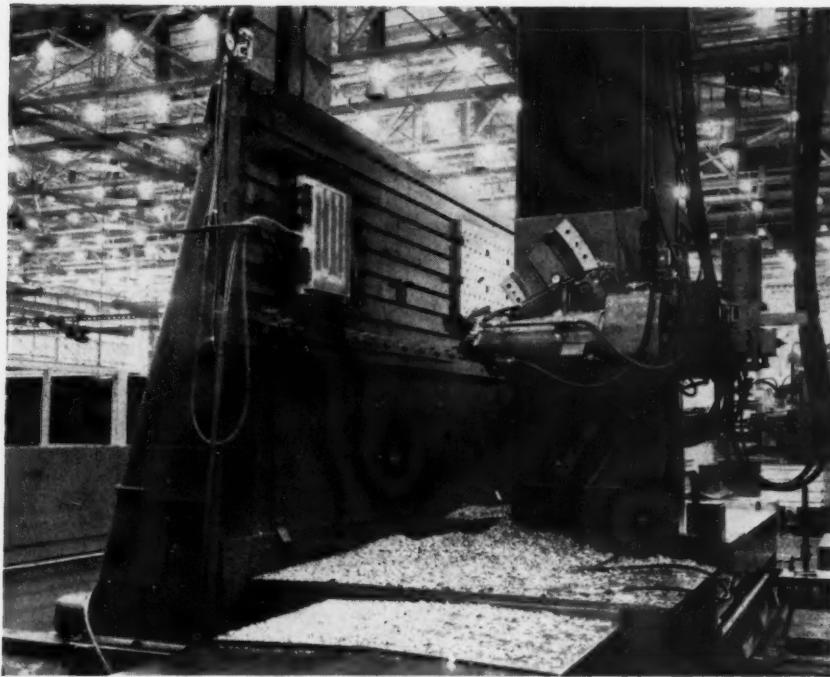
These gains may be expressed in terms of lowered tooling costs, higher productivity and improved part quality. Vacuum milling fixtures are



Doubler is milled on finger trace profiler using vacuum probe with auxiliary clamping.



Rear view of finger trace profiler showing vacuum probe fixed to left side of fixture.



Milling aircraft access door on 5-axis numerically-controlled profiler using vacuum probe.

simple to design and build. Absence of mechanical clamps shortens loading time, exposes larger part surface areas to cutters and eliminates defacing of previously finished surfaces. Parts are firmly held down on nesting surfaces "all the way around."

But airframe parts in the small and medium size category are usually complex enough to offer much less optimum clamping areas. Here then was the problem. Could these small part areas be vacuum clamped to fixtures with assurance as to safety and precision? While a line gage will indicate that a safe level of vacuum, say 26 inches, exists in

a system, this is no assurance that the same amount is available under the part surface being held. Leakage caused by part warpage or faulty seals may cause a drastic and sometimes dangerous difference.

To meet this problem, a probe unit was designed and developed by the Long Beach Douglas Plant Engineering Department. The purpose of this unit is to warn the operator by red light (or, if more convenient, by electric horn) when the vacuum clamping force *beneath the part* has fallen below a safe operating level. Essentially, it consists of a suitable length of probing hose with one end connected to a

Vacuum Probe Solves Problem in Milling Airframe Parts . . .

pressure sensitive switch, which may be adjusted to operate at some pre-selected safety level, say 15 inches of mercury (approximately 7 p.s.i.). The switch, in turn, operates a conveniently located box containing red and green lights. The other end of the hose is equipped with a female disconnect fitting for handy plug-on connection with male fittings that are furnished with each milling fixture.

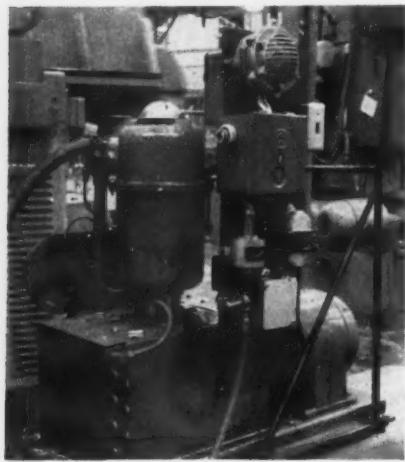
Here is how the probe unit works. The vacuum supply line is connected to the milling fixture in the usual way. The part is then placed on the fixture and the probe hose plugged onto the male probe fitting. If there are no leaks, the operator will then notice that the green light has been substituted for

the red one—an indication that it is safe to proceed with the machining operation. The probe continues to sense the vacuum level throughout the operation, maintaining a green light, unless leakage causes clamping force to fall below the preset level.

Location of the probe fitting on the fixture must be carefully selected if the idea is not to be defeated. The fitting should be located at a place where leakage is most likely to occur. If this is not known, then a place approximately opposite the vacuum supply fitting should be chosen. Thus, maximum distance between supply and probe fittings is maintained, so that a difference in vacuum level across the span of the fixture will be noted. Plugging the probe onto the vacuum supply at the point of fixture entry is not recommended. Such an application will yield only information already known to the operator; namely, that there is an adequate level of vacuum in the system and whether the part is on the fixture or not.

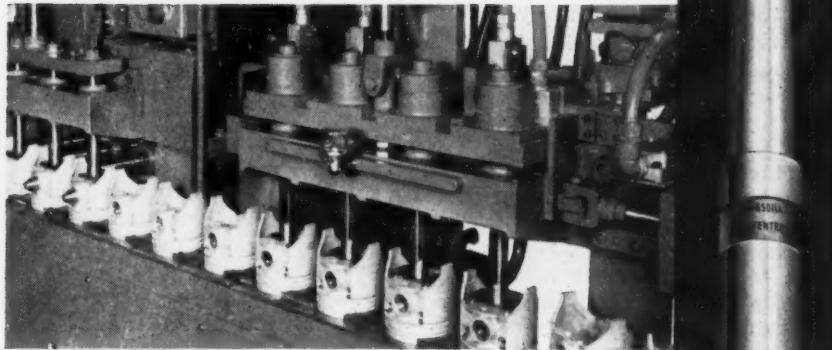
In dealing with this subject, it is not our wish to leave the impression, that, through the use of vacuum probes, requirements for mechanical clamping will be completely eliminated. We have found auxiliary clamping to be a valuable adjunct to vacuum in many special cases.

Growing requirements and successful applications, showing an excellent safety record, have brought about permanent installation of vacuum probe units on 40 standard milling and profiling machines at the Douglas Long Beach Plant.



Portable vacuum unit equipped with probe unit uses an electric horn to warn the operator when lights cannot be seen. Box which contains the lights is shown directly behind the horn and facing in the opposite direction.

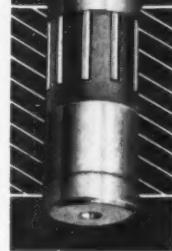
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How to Solve Your Supervisory Problems

By ALFRED M. COOPER
Contributing Editor, *Modern Machine Shop*

Much of modern industrial supervision must be carried out during periods of stress. Sometimes such tensions are due to sporadic unemployment; sometimes equal stresses are brought on by labor shortages; sometimes the major stress lies with the worker, and again it will be felt primarily by the supervisor.

In instances, extreme stress may develop because of strained international relationships, and these tensions affect equally the supervisor and the subordinate. Or, in an election year, it may be that the various candidates, by "viewing with alarm," may get the entire populace jittery. Again, the uneasy feeling the people of all the world have regarding the bare possibility that H-bombs may even accidentally be detonated at some future date, must affect adversely the peace of mind of worker and supervisor.

Stress can wreck cordial relationships between the worker and his

boss, between members of a family, and even between management and supervisors. Since we appear destined to exist in such a world of unrest for years or even decades to come, it is advisable that the supervisor—who is responsible for just about everything covered under industrial relations—should determine on a course of action to cover any contingency arising from extreme worry by everybody, from management down to last employee.

Such a course of action, of course, must vary with the people who most feel the stress of the moment. For example, I have known of cases—years ago—when all employees of a plant knew they were to suffer wage cuts—that is, everyone but the supervisors. Similarly, it might happen that everyone except the supervisors in a given department are concerned with the possibility of imminent lay-offs.

These exact situations do not often arise today, but they have

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their counterparts in some of those other factors I have mentioned. A group of employees may possess concealed fears and dissatisfaction based on what they read in the papers, hear on radio, or see on television. As a supervisor gains in experience he begins to wonder if regular perusal of the front page of a daily newspaper may not be the worst possible way for anyone to start off any day. It was Mark Twain who said, in effect, "I am an old man, and have experienced many tribulations, most of which never happened."

Once the supervisor comes to realize that most of the things that worry his subordinates may very well never actually come to pass, he is in a better position to deal sensibly with these fears. And as a beginning he may well start by analyzing his own forebodings, and either rationalize these out of existence, take action to remedy matters, or determine to live with those he cannot obviate.

Not until the supervisor has thus mastered himself can he properly direct the efforts of others. And in the face of the direst of emergencies the supervisor who has not earlier *thought his way through* almost any conceivable situation, may find difficulty in inspiring subordinates with confidence in him as their natural leader.

This trick of thinking through situations in advance of their occurrence is the mark of the seasoned, dependable head man. For it is true that such a supervisor, even when confronted with imaginable contingencies, appears to absorb the shock of these more readily, and even continues to radiate a calm con-

fidence which he may be very far from feeling.

With little confidence in his immediate superior the worker is in a tough spot when emergencies develop—even when the emergency happens to be but the upsetting of a routine of long standing. This is why the executive sometimes says of any foreman or office manager, "He is a fine man to have around when the going is rough."

From my experience and observation this is the finest compliment that can be paid to any supervisor. For a good man in an emergency is also likely to be a dependable man under routine working conditions.

In the days and years ahead the supervisor who has mastered the technique of "thinking through" all conceivable, and perhaps quite a few "inconceivable" situations, will find his work considerably easier and the respect of supervisors and subordinates alike greatly augmented.



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Facts You Should Know About Cutting Fluids

**A wealth of practical information for anyone who uses
a cutting fluid on a metalworking operation.**

By E. J. RITTER

Director, Cimcool Laboratory,
Cincinnati Milling Products Division,
The Cincinnati Milling Machine Company

At the outset of this discussion on materials that are designed to help cut metal easier, faster, or better, we would like to make it clear that principally our remarks will be confined to two main types of cutting fluids, those based on water and those based on oil. Experience has shown that these two types of fluids are quite suitable for shop use because they meet requirements in areas such as safety, availability, and cost.

One of the requirements placed on cutting and grinding fluids is that they provide cooling. Cooling is not the only factor, but it is an important one and frequently the

reason why water is the fluid of choice. Of course, there are applications where oil base cutting fluids must be used. For example, some automatic screw machines are so designed that the cutting fluid is intended to serve also as the lubricant. On other automatics, water base cutting fluids are being used with excellent results.

Cutting oils are mineral oils to which materials known as "additives" have been added. These additives comprise such materials as lard oil, sulfur, sulfurized fats, sulfur chlorinated fats and so on. Various viscosity oils are used, and various combinations of the addi-

tives may be used, depending on the job to be done and the metal involved.

Some of the sulfurized cutting oils are quite corrosive to copper and copper alloys, turning them black due to formation of copper sulfide. These can be avoided by using additives which do not stain copper.

Sulfur-chlorinated cutting oils are sometimes responsible for the staining and darkening of steel, particularly during humid weather. When moisture from the air gets into such a cutting oil, hydrolysis can occur, resulting in the formation of hydrochloric acid, which is extremely corrosive. This can be combatted with other additives which neutralize the acid, but a better approach is to start with a cutting oil which is not sensitive to the presence of moisture in the first place.

Now let's consider water base cutting fluids. There are three main types — transparent solution types, soluble oils, and a third class which, for lack of a better name, can be called synthetic types.

The solution types are almost invariably based on sodium nitrite, and contain in addition other rust inhibitors, and occasionally bactericides. They usually show relatively good rust control, and little tendency to become rancid. *They usually do not contain much in the way of lubricants or friction reducing agents, and consequently are most often used for grinding, and only infrequently for machining operations.* This, of course, is a drawback to prevent their more widespread use. A minor disadvantage is that, as commonly formulated, they do

The Author



EDMOND J. RITTER, for the past ten years, has been engaged in directing research, development, and application activities at Cimcool Laboratory, Cincinnati Milling Products Division. He is a Chemical Engineer and Chemist, having brought to his present work an extensive background of experience gained from formal schooling as well as industrial employment. He attended Ohio State University, University of Toledo, Purdue, Wayne University and Xavier University. During previous employment he worked in the petroleum field, specializing on problems involving water and organic syntheses.

not provide sufficient lubrication for slideways.

Of course, a machine tool should be properly lubricated in the first place and one should not depend upon the cutting fluid to lubricate the machine. Provision is made on today's machine tools for their proper lubrication. Oiling systems are provided, but frequently water repellent lubricating oils are not used. If the operator is accustomed

"Soluble oils are used extensively for machining and grinding."

to using cutting oil he may neglect to push once a day the button that provides slideway lubrication, because with cutting oil it was not really necessary. When you switch him over to a transparent solution fluid this is no longer true; now he has to remember to push the button to make sure that lubricant is supplied to the moving parts of the machine. This is a small price to pay for the advantages that a water base fluid bring him—such things as cooler, cleaner, odorless operation.

Soluble oils generally consist of an emulsifying agent, such as petroleum sulfonate and oil, and little or nothing else. They may also contain extreme pressure agents or bactericides, but usually do not. They are generally low in cost per gallon of material, not necessarily low in actual cost. Soluble oils, of course, vary considerably in quality, some are quite good, some are very poor. They are used extensively, both for machining and grinding. Major objections to their use, certainly of the poorer quality ones, are relatively poor rust control, relatively great tendency to become rancid. Their lower first cost may be nullified if extra heavy mixes are required in order to control rust, or if frequent changing of the machines is necessary because of rancidity. *Many of them, especially if heavy mixes are utilized, will smoke excessively.* They are generally messy and dirty, and consequently not good from the standpoint of operator appeal. They frequently leave much to be desired from the standpoint of tool life and performance. Neverthe-

less they are usable; they are widely employed because their price per gallon is often low, and in some cases their use is justified.

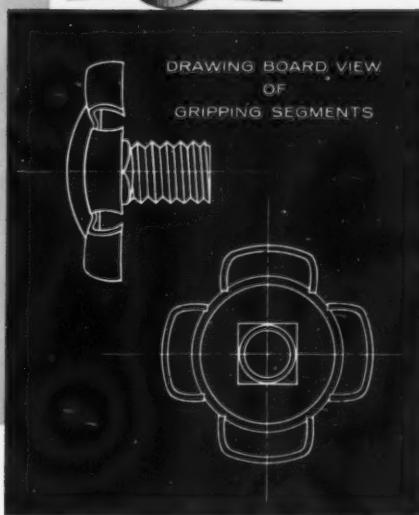
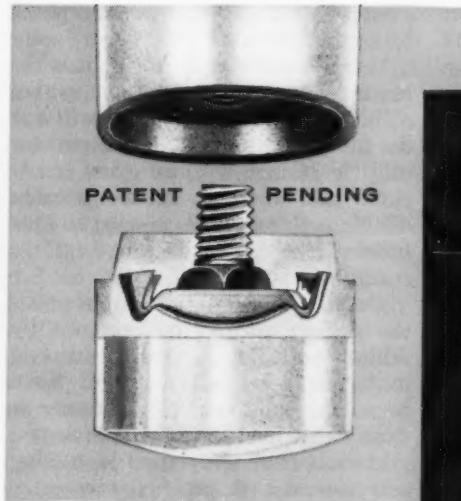
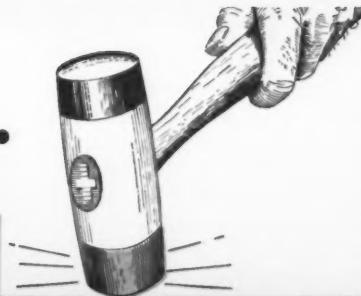
Because of the obvious disadvantages of soluble oils the way was paved for the introduction of synthetic types. Synthetic types may cost a bit more per gallon, but should give you more for your money. We will limit consideration to those that may cost more initially, but which more than pay for their keep.

Included in the premium types available are super solubles and chemical emulsions. Super solubles resemble soluble oils but contain additives which impart improved performance characteristics. By contrast, a chemical emulsion will contain relatively little oil, depending upon the chemical agents used for lubrication and friction reduction. The low oil content contributes



"Cutting oils are mineral oils to which materials known as additives have been added."

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"Water is a poor lubricant . . . so are oils."

to better cooling, elimination of smoke, and greater cleanliness.

Essentially, such products are compounded to give superior tool life and finish and high production rates, as well as good emulsion stability, superior rust and rancidity and dermatitis control. Since they are important I'd like to touch on each one of these points in a little more detail.

In the first place, you mix such a product with water. You may use a mix containing 50 or more gallons of water for each gallon of cutting fluid concentrate. The reason for doing this, again, is because water cools effectively; it is clean and safe.

Water has advantages; but water alone has disadvantages which must be overcome by the cutting fluid concentrate which is added to the water. Disadvantages are: (1) water is a poor lubricant; (2) it is very corrosive, causes iron and steel to rust and corrodes many other metals; (3) bacteria can grow in water, resulting in rancid odors.

Now let's take these one at a time. Water is a poor lubricant. For that matter so are oils. Of course, oil normally functions satisfactorily under hydrodynamic conditions, as a film on a bearing for example. Under metal cutting conditions this will not suffice, because temperatures and pressures at the tool point are much higher than they are in a bearing, so that when we get into the range of what is known as boundary lubrication, ordinary lubricants fail. That is why sulfurized and chlorinated additives are used in cutting oils, because they

give chemical reactions, such as those resulting in the formation of sulfides, chlorides or phosphides, which prevent actual metal to metal contact, and so provide lubrication even under severe pressure-temperature conditions.

It is not enough then, just to incorporate mineral oil into a water soluble product. If plain oil will not do the job when used as a cutting oil, it certainly will not when emulsified into water to make a soluble oil. Something else is needed to give lubrication under metal cutting conditions.

One might ask, if you can improve the performance of cutting oils by adding sulfurized or chlorinated materials, why not just add them to soluble oils too? The answer is that sulfurized and chlorinated materials commonly used in cutting oils are not suitable for use in water, because they hydrolyze. In



"The solution types do not contain much in the way of lubricants and are used for grinding."

"... water base cutting fluid must provide rust control."

the presence of water they form hydrochloric acid and hydrosulfurous acids. These acids are extremely corrosive—they are very bad from the standpoint of rust and corrosion. Such corrosiveness in turn contributes to conditions conducive to anaerobic rancidity, where the coolant turns black and smells like rotten eggs.

A logical approach then would be to use extreme pressure or friction reducing additives which are compatible with water. Such materials are hard to find, but they do exist, and any synthetic product worthy of the name should contain such additives, which improve performance and finish in the presence of water, under metal cutting and grinding conditions.

The next point is rust and corrosion control. Any usable water base cutting fluid must provide rust control. However, if you

test some of these products in your lab, or in your shop, you will find that some have much better rust control than others. Presumably the premium types, since they cost more, will give better rust control. This is frequently the case, but of course, not always. It's entirely a question of what rust inhibitor additives are present in the product—if it contains a lot of good inhibitors it will give good rust control—if it doesn't, it won't.

This brings up the question of control. No cutting fluid is completely foolproof. If you use a product that contains lots of the very best rust inhibitors this does not absolutely guarantee you won't have any rust, any more than you could buy the best automobile made and not run into a tree if you drove it carelessly.

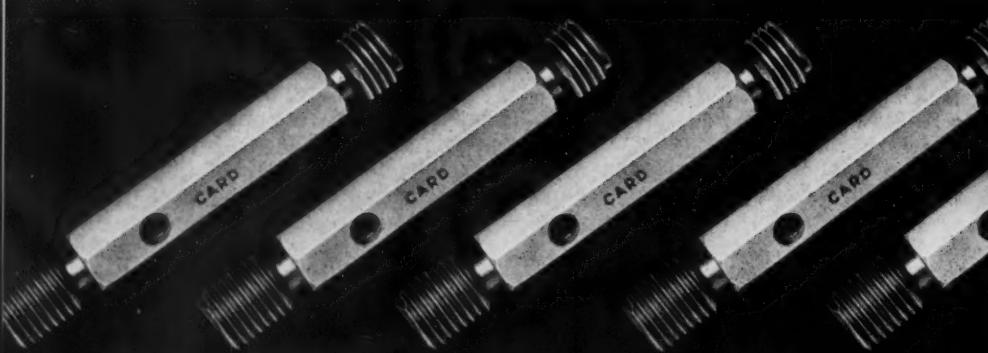
If you use a really high quality product, you can operate with weaker mixes and still get rust control, or you can lick the tough rust problems, and you have a bigger safety factor in everyday use of such a product. But you do have to have some control. A cutting fluid that gives you superb rust control at 50/1, probably won't at 500/1, and surely won't at 5000/1. For one reason or another, extremely weak mixes occasionally do occur. For example, the man on the night shift decides it's too much trouble to get the cutting fluid concentrate to pour into the machine, or the premix that has been prepared for him. Instead he just turns on the water hose and runs in a hundred gallons of clear water. So perhaps the mix



"Many of them, especially if heavy mixes are utilized, will smoke excessively . . ."



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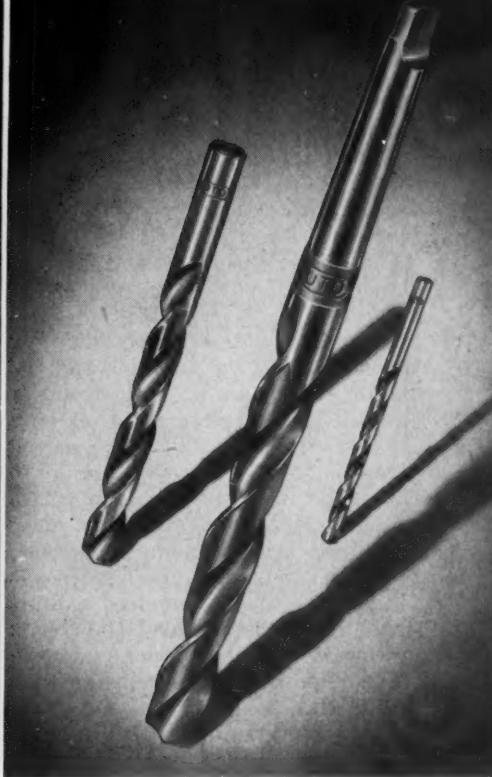
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"Central systems are a big help . . . "

that was 50/1 is diluted until it is only 250/1. *You come around the next day and wonder why the machine or the parts are rusty, because the man that sold you the cutting fluid told you it would control rust.*

Of course, companies that have laboratory facilities can run control tests, and many of them do, and such checks are valuable but they do take time. Possibly a better bet is to institute good mixing practices for the men in your shop. Central systems are a big help, because you only have to run one sample to know what is going into a lot of machines. For individual machines not on a central system, the premix tank is a good idea. You have a tank that holds several hundred gallons, and a man is assigned the job of filling it with the proper materials. The other men get their cutting fluid from this tank, and you have reasonable assurance that they are using what they are supposed to be using. If you don't institute something like this, you may get all kinds of mixes. One operator mixes the fluid in his machine about ten times as strong as is needed, and that's a waste of money. Another mixes it too weak, the parts get rusty and have to be cleaned up, and that's a waste of money, too. So if you institute proper mixing procedures it will more than pay for itself, not only in money, but in good performance and satisfaction all the way around.

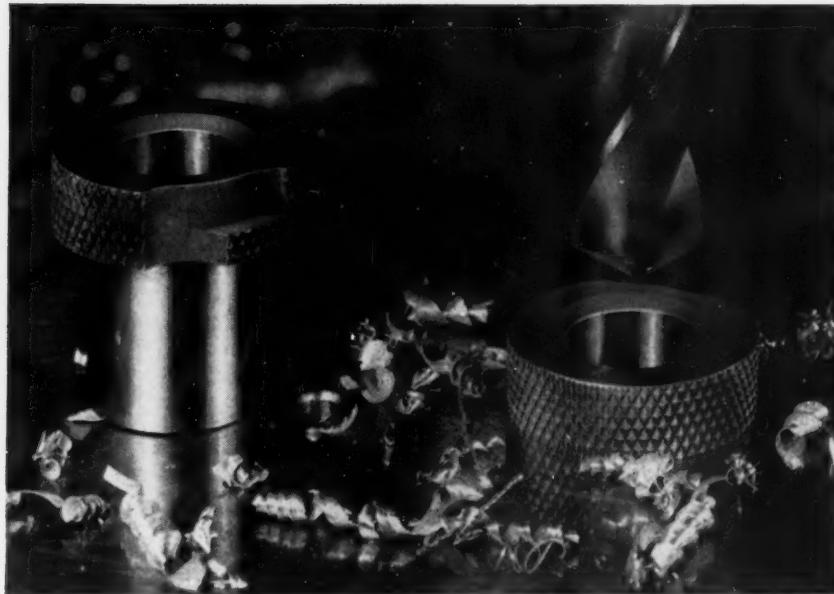
As for laboratory checks on the strength of mixes, there are several in use which we will mention

briefly. The oldest and best known method, one commonly used with soluble oils, is to place the mix in a graduate and add acid to it. This breaks the emulsion, the oil phase floats to the top, you measure the amount of it, and that tells you about how strong the mix is. The advantage of this test is that it is easy to run. There are at least a couple disadvantages. One is that some of the premium types on the market do not contain much oil, not enough to provide an accurate reading when you break it out. The other is that it is very common to have lubricating oil leakage from the machine into the cutting fluid reservoir. This "tramp" oil gets beaten in with the coolant and gives you a fictitious answer when you run this type of test.

Another method that is occasionally used is to measure the alkalinity of the mix, either by titrating



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"...you can't keep bacteria out of cutting fluids."

with acid in the presence of an indicator or by checking pH, either with paper, which is not very accurate, or with a pH meter. This is pretty easy too, but suffers from the disadvantage that alkalinity often is not the correct measure of how strong the mix is. There are a number of things that can throw it off, for example, the alkalinity naturally present in the water you use to make the mix, or changes in alkalinity that occur with use that are not directly related to the strength of the mix.

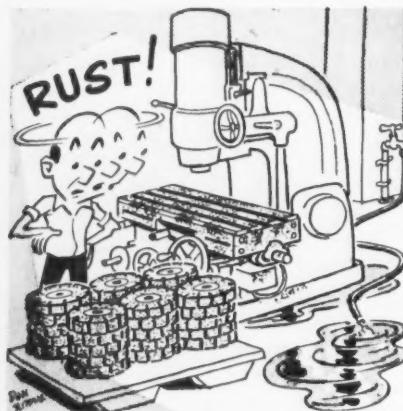
Another method, which could be used with most soluble oil or synthetic products is based upon titrating the anionic ingredients with a cationic solution, using an indicator that changes color at the end point. This method is a little novel to most people, even chemists, who when they go to school study acid-base and oxidation-reduction

titrations, but usually are not acquainted with the idea of anionic-cationic titrations. However the method works, it's not especially difficult, and we'll be glad to pass it on to any of you who want to try it.

The next topic on the agenda is rancidity. Apparently the term rancidity goes back to the old days when lard oil was the main cutting fluid. Lard oil is fat, and if you take a bucket of fat and let it sit around for a few days, say a few hot summer days, it will begin to smell. Likewise, when lard oil used to run in a machine for a few days, or weeks, or months it would develop a bad odor. When a fat spoils it is called rancid. Nowadays any bad odor in a machine, irrespective of its source, is called rancidity.

In most cases, not necessarily all, such odors are due to the growth of bacteria. Of course, you can't keep bacteria out of cutting fluids. They exist everywhere, in the air, on the machine and the parts, in the water you use to make the mix, on the operator's skin. Most bacteria are harmless, but there are some that can grow in water, in cutting fluids, and produce undesirable odors. There are even a few that are pathogenic and can cause human disease, although in our experience there is little cause for concern with these — it is extremely rare for human disease to be transmitted by means of the bacteria in cutting fluids, which normally do not furnish a suitable substrate for the growth of pathogens.

But bacteria can produce undesirable odors. There are two



"You come around the next day and wonder why the machine or the parts are rusty . . ."

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FREE TRIAL OFFER. We'd be glad to send five pounds of Lan-O-Kleen PLUS and loan a dispenser for free trial. Or we'll send a smaller sample for evaluation. Just call your local WEST office. Or mail the coupon to our Long Island City Headquarters, Dept. 11.

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September, 1959

modern machine shop 151

"... use a product which does not become rancid."

main classes of bacteria, the aerobes and the anaerobes. The aerobes grow in the presence of air, the anaerobes in the absence of air. The anaerobes can be particularly troublesome in machines that are shutdown, say over a weekend. As long as the machine is running it keeps beating air into the cutting fluid so that conditions are not suitable for the growth of anaerobes. During a shut-down however, the aerobes soon use up the available air or oxygen in the coolant and then the anaerobes start to grow. *All natural water supplies contain inorganic sulfates. The anaerobes utilize these in their metabolism, and give off H_2S , rotten egg gas.* This causes what is called Monday morning odor—the rotten egg gas accumulates in the coolant over the weekend, and is released when the operator turns on the machine. In a little while most of it may blow off, but an operator isn't



"The anaerobes utilize these in their metabolism and give off H_2S , rotten egg gas."

apt to be happy about the situation.

To avoid rancidity one should use a product which does not become rancid. It is possible to use a cutting fluid that rarely gets rancid, and it is also possible, very easy as a matter of fact, to get one that goes rancid very quickly.

We are often asked this question: What test can we set up to determine if a cutting fluid is bad from the standpoint of rancidity? The answer is that there is no easy way—the best thing to do is to put it in a few machines and try it.

We do not know of any simple test for this. We do bacteriological research, have been for years, but the test set-ups are complex and time consuming. We do plate count work when we test new bactericides or when we are developing new experimental cutting fluids, but it takes complete bacteriological equipment and a bacteriologist. It takes a great many plates and it is quite a bit of work. We also use Warburg equipment, where you measure the growth or death of bacteria indirectly by measuring their respiration, the amount of oxygen they utilize. This is a very valuable technique, but it is rather involved, and we would not recommend it to the average industrial laboratory. We also would not recommend any quick easy methods, at least we have not seen any that can be depended upon.

You have to be careful, in setting up any test, to use a method because it is meaningful, not just because it is easy to run. Therefore, I would suggest actual shop trial to deter-

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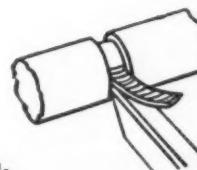
1. T-SHAPED BLADE . . .

provides liberal side clearance that eliminates excessive friction.



2. HOLLOW-GROUNDED TOP . . .

causes chips to collapse thus relieving friction against sidewall of cut.



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collapsed chips are drawn away from sidewalls permitting coolant to reach blade cutting edges.



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Cutting Fluids . . .

mine whether or not a given cutting fluid will give you good rancidity control.

A premium cutting fluid certainly can be expected to meet this requirement, to give you good rancidity control. This can be achieved in two ways—one is by being careful about what ingredients are used in formulating a cutting fluid. There are so many different kinds of bacteria with so many different food requirements, that almost any ingredient will serve as food for some bacteria. There are bacteria for example that can live on mineral oil, others that can even live on strong sulfuric acid. To be practical about it though, if you look into the matter you will find that some cutting fluid ingredients are very bad from the standpoint of rancidity, others cause very little trouble. In formulating a cutting fluid then, it is advisable to avoid the bad ingre-



" . . . many common bactericides, when used too strong, may cause skin irritation."

September, 1959

dients, and to use the good ones.

The second approach to controlling bacterial growth and rancidity is the use of bactericides. This is not as simple as it might seem at first glance. Many kinds of bacteria exist, and what kills one type may not affect another. *It is also true that many common bactericides are not effective unless they are used in very large quantities, but when used too strong they may cause skin irritation.* However, it is possible to find bactericides which are both effective and safe, and such bactericides should be included in cutting fluids.

We mentioned that the best way for you, the user, to test cutting fluids for rancidity control is by trial in your machines. We might add that the best way to tell if the machine has gone rancid is to smell it.

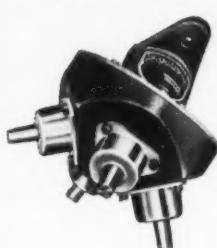
Since our organization has a policy of giving service to customers, every once in a while some one sends us a sample of mix from a

machine and says, "Run a bacteria count on this for us, we want to know if it is rancid." Well, the truth of the matter is if you have to send a sample to find out if it is rancid, then it isn't—because if it is, your nose will tell you quickly enough. Another point about this is that it is possible to have a sample with a very low count that smells bad, or a sample which shows a

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Cutting Fluids . . .



" . . . modern production rates and quality requirements could not be met without them."

very high count but which does not smell at all. For example, the sulfate reducers that form H_2S can produce some very disgusting odors, and yet these anaerobes will not show up in an ordinary plate count at all, because air is present in the Petri dishes in which the test is run, and

these particular bacteria won't grow in the presence of air.

Plate counts do have some value, however, as a rough index. Cutting fluids which show extremely high counts, say 50 to 100 million per ml, are frequently rancid, whereas samples which show lower counts, a million or two, usually are not.

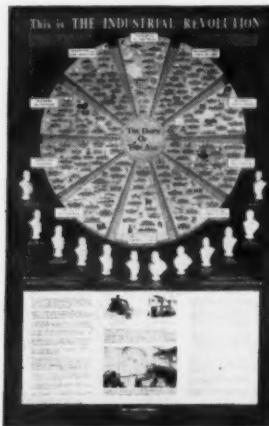
It is possible to extend the life of the cutting fluid in a machine or a central system by dosing it with a bactericide and this is fairly common practice. The same precautions have to be taken in that case, as when the bactericide is already formulated into the cutting fluid—that is, the bactericide should be both safe and effective.

In conclusion we would point out that cutting fluids are used because modern production rates and quality requirements could not be met without them. Our purpose in bringing attention to both special and common characteristics has been in the hope that this kind of information will ultimately enable a user to achieve the best possible results.



"The Dawn of This Age," a colorful wall chart that reproduces the three-story-high educational display in its new Hall of Progress, has been issued by The DoAll Co., Des Plaines, Ill. The 22 x 34-inch chart, printed in blue, yellow and black, is an attractive and informative wall poster especially suited for schools, libraries, institutions, business offices and plant information centers. The poster records the 157 major events that catapulted man from a life of drudgery, privation and insecurity to one of abundance, leisure and security in only 150 years.

The "Dawn of This Age" chart is available at 50 cents in single copies and in quantities of 100 or more at a price of 25 cents each.



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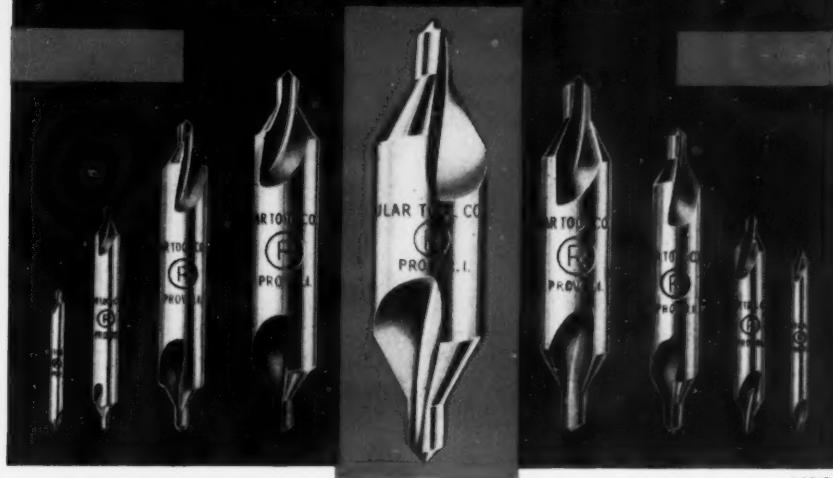
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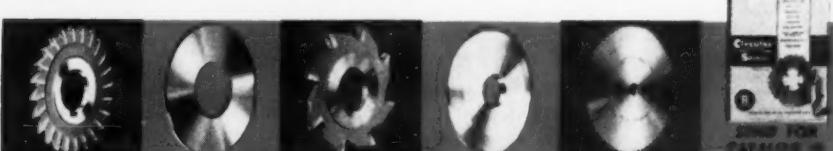
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**Techniques for increasing output with
newly developed machines and tools.**

Rail-Mounted Drill Presses Speed Drilling and Tapping of Long Strips

Two Walker-Turner overhead drill presses, mounted on a single crane rail, speed the drilling and tapping of long strips at Kidde Textile Machinery Corporation, Bloomfield, New Jersey. The strips, which are guide bars for knitting machines, are 50 to 200 inches long and have tapped holes an inch apart along their length.

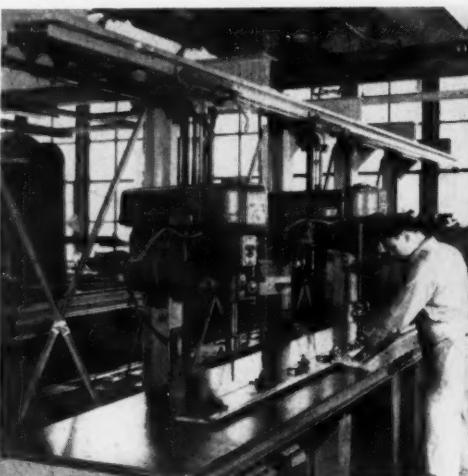
Kidde built an 18-foot table with a cantilevered support for the rail on which the Walker-Turner overhead drill presses ride. The work is held in jigs for drilling and in clamps for tapping. The operator first drills a row of holes in the work with one drill press and then taps them with the second drill press, which is equipped with a tapping attachment.

A multiple head attachment that drills five holes simultaneously is used on the first drill press for drilling holes of less than $\frac{1}{4}$ -inch diameter. It drills 450 holes per hour. The tapping machine is rated at 400 holes per hour.

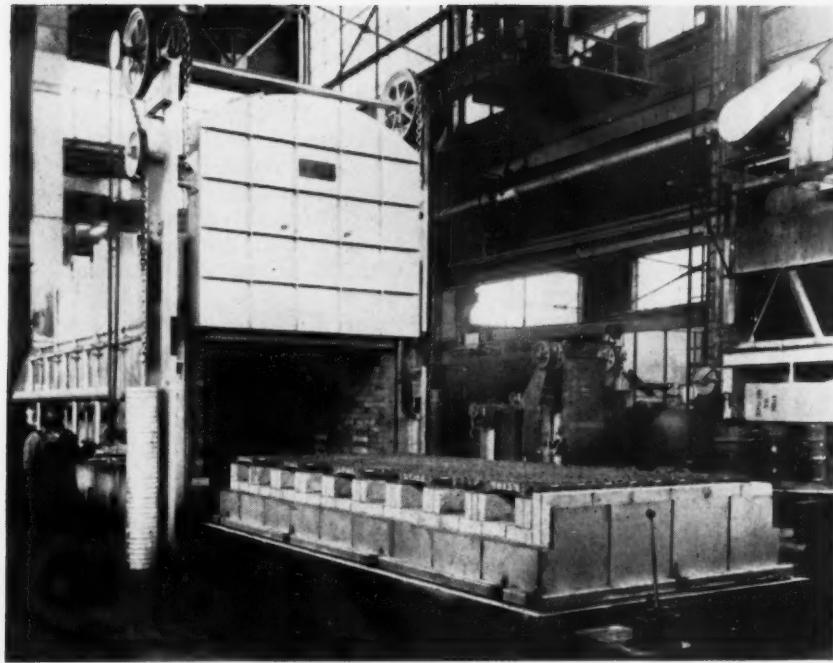
The overhead Walker-Turner drill

presses used in this setup are made up of standard components—a 20-inch drilling head, a 33-inch column with raising mechanism, and the Walker-Turner overhead ball bearing carriage. The rail on which the drill presses ride is of welded construction machined to fit the Walker-Turner carriage, and bolted to the supports.

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Long guide bars for knitting machines are drilled and tapped at a fast rate on the rail-mounted drill press setup illustrated herewith.



Huge high temperature brazing furnace installed by the Nashville Division of Avco Corporation, for the production of stainless steel honeycomb structures up to 7 feet wide and 25 feet long.

Brazing Huge Stainless Steel Honeycomb Structures

A huge, high temperature brazing furnace for producing Avcomb brazed stainless steel honeycomb structures has been installed by the Nashville Division, Avco Corporation. The furnace, designed by the Lindberg Engineering Corporation, will be used for making both flat and contoured Avcomb panels up to 7 feet wide and 25 feet long.

Avcomb brazed stainless steel honeycomb structures, as developed by the Nashville Division, are de-

scribed as stronger than steel and yet so light they float on water. Avcomb's heat resistance and high strength-to-weight ratio are said to make it ideal as a structural material for such supersonic aircraft as the B-70 and F-108, and for missiles and space vehicles. The material also is suitable for several other uses, including civilian applications.

The Lindberg furnace is described as a double-ended, car bottom, gas-fired box type furnace. The chamber is 9 feet wide, 30 feet long and 50 inches high. The furnace employs over and under "firing" from staggered burners. The unit is capable of continuous operation at

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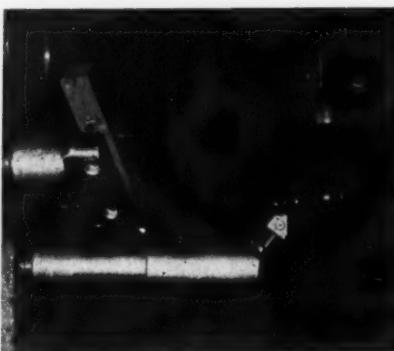
temperatures ranging up to 2300 degrees Fahrenheit.

A special flat car with a self-contained motor drive device is used to transport the Avcomb panels in and out of the furnace. The walls of the furnace are heavily insulated with brick and slab materials and the door is refractory-lined. The furnace is equipped with complete instrumentation to record all stages of heat-treating and brazing cycles. For more data circle 2 on Postpaid Card

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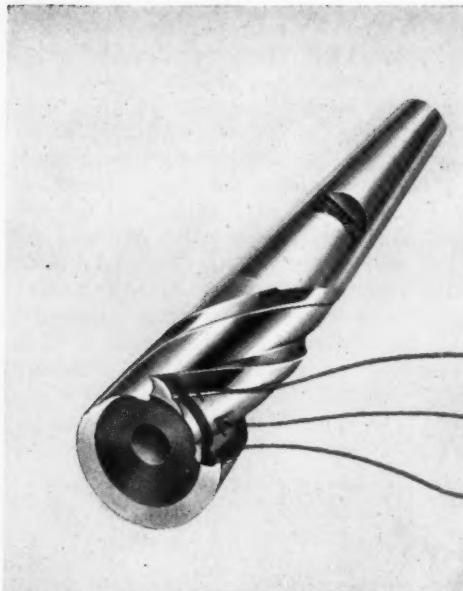
Tool Modification Cuts Boring Job Costs

Boring tool cost was cut to 40 percent of former cost when a precision type tool was modified to accommodate a throw-away type carbide insert instead of a brazed tip tool cartridge in a midwestern plant. Additional savings resulted



Kendex screw-on type inserts on a modified DeVlieg Microbore cartridge reduced tool costs considerably in boring 3-inch diameter oil seal holes in S.A.E. 1045 steel track rollers.

September, 1959



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more production . . .

from reduced time for changing tools.

The change was made for boring 3-inch diameter oil seal holes in S.A.E. 1045 steel track rollers. A standard DeVlieg Microbore tool cartridge was modified to take a Kindex screw-on button insert. This is a Style TD6 triangular insert, Grade K5H, obtained from Kennametal Inc., Latrobe, Pa.

The saving resulted from an increase from 90 pieces per tool grind to 180 pieces per insert edge. Total pieces were 990 with 10 regrinds of the brazed tip tool, and 540 pieces per throw-away insert. No change was made in feed (0.008 inch per revolution), speed (331 s.f.m.), or depth of cut (1/64 inch). The machine used for the job is a Foster turret lathe of 7 1/2 horsepower.

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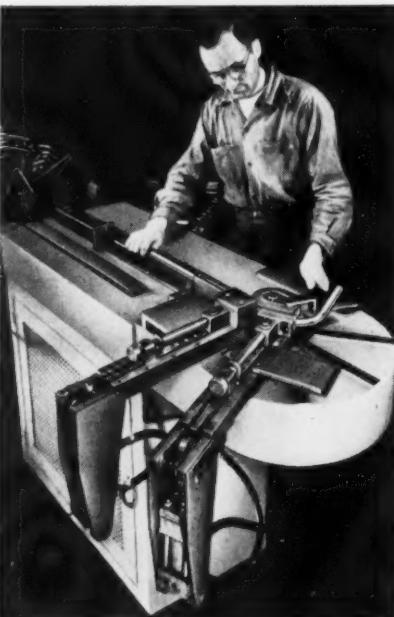
Power Bender Speeds Forming of Preplated Lawn Mower Handles

The Foley Manufacturing Company, Minneapolis, forms 180 preplated lawn mower handles an hour on a Di-Acro Hydro-Power bender, use of which has cut the company's production costs by increasing production speed and by freeing Di-Acro hand benders for experimental work in the model shop. The handles are formed from 3/4 to 7/8-inch O.D. steel tubing with an 18-gauge wall thickness. Bends with a center-line radius as small as 2 inches are made in the 3/4-inch

tubing. All tubing is purchased preplated with electro-zinc and Proseal.

According to William Nettekoven, Foley's methods engineer, preplating is feasible with Di-Acro benders because the gripping jaws do not damage the finish. Thus, the company is able to save 33 percent in storage space and at least 50 percent in handling time. An advantage gained from having power benders in the production shop and hand benders in the model shop is that any bends developed by Foley's experimental department can be put into immediate production.

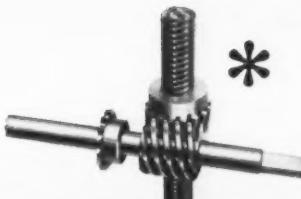
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Operator of Di-Acro Hydro-Power bender is completing second bend in a preplated lawn mower handle at Foley Manufacturing Company. The two bends are formed in one continuous operation, allowing operator to maintain a speed of 180 handles per hour.

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HEAVY LIFT...
OR BOTH!

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September, 1959

modern machine shop 163

more production . . .

Portable Power Source for Set-Up Clamps Saves Tooling Costs

A portable power source for PowRlock automatic setup clamps has enabled Mission Mfg. Co., Houston, Texas, to speed machine loading, cut production time, and save on tooling. PowRlock clamps are operated automatically by an air-hydraulic booster system and can be used on any standard machine. Mission's tool engineer, B. F. Woodcock, built PowRlocks into fixtures used for slabbing the face of plug valve core halves and fixtures used for holding rock bits

for milling of a carbide insert slot. Mr. Woodcock equipped the air-hydraulic boosters with quick disconnect couplings and a self-feed system that compensates for loss of hydraulic fluid and acts as a bleeder. He then mounted the entire booster unit on portable tables. Now, each portable "power system" can be moved from machine to machine. The output of several machines is increased, without any additional tooling cost.

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Industrial Distribution Film

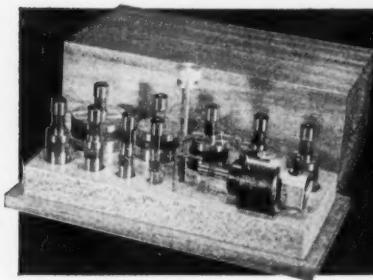
The vital but often misunderstood role of industrial distribution in the business economy is dramatized in a highly entertaining and informative 20-minute color film produced by Standard Pressed Steel Co., Jenkintown, Pa. Relying on a Mike Wallace-type interview technique for its lively format, the 16 mm. movie, entitled "A Talk with Mr. D," covers all the principal ways in which the industrial distributor serves both industrial buyer and supplier alike.

Produced primarily as an industry service by SPS, the film has been endorsed and is being distributed by the three associations that make up the "Triple Industrial"—the National Industrial Association (NIDA), the Southern Industrial Distributors Association (SIDA) and the American Supply and Machinery Manufacturers Association (ASMMA). Prints are also available on request from SPS for showing by any industrial distributor, by purchasing agents or by other interested industry groups.



Portable power source for automatic set-up clamps speeds loading of milling machine.

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70 or more
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Compensate for any amount of deflection
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Eliminate search for matching cutter and
stylus. Select cutter, then adjust holder to
proper size.

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Prolong cutter life—regrind to sharpen
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performs equally well as new one.

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Accuracy no longer depends on finding
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eter screw in the adjustable stylus holder
permits controlled stock removal.

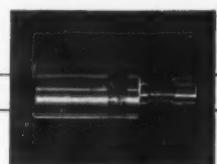
MINIMUM STYLII REQUIRED

Nine stylii do work of 70 to 100. When
cutter change is required, stylus need not
be replaced.

TEMPLATE ERRORS CORRECTED

These discrepancies in template can often
be "adjusted out" while cutter is in motion.

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TOOL  PRODUCTS



CRITERION MACHINE WORKS

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September, 1959

modern machine shop 165

ideas from readers

Several time-saving ideas and suggestions for the man in the machine shop.

Portable "Burning Buggy"

By IRA S. ROBERTS

The portable "burning buggy" shown herewith, used by the Maintenance Department of The Timken Roller Bearing Company's Steel and Tube Division, has made the job of carrying an acetylene unit a simple task. The buggy can be

moved by crane, fork lift truck or rolled into position. A hook provided at the top of the frame of the buggy permits cranes to get a firm hold, and slots provided near the bottom of the buggy are for a lift truck. A returnable reel stores the hoses. Tanks are chained to the frame and are removed only when empty. The fire extinguisher shown is a permanent part of the unit. The buggy was designed and built by the company's maintenance department.

★ modern machine shop ★

Combination Roughing and Finishing Tool

By R. K. DULEK

Removing scale from lengthy hot rolled bars by turning in an engine lathe was a very slow and costly procedure. Two passes were required for a good clean up job, and production was fairly high.

To handle the job more efficiently, we devised the tool shown in Fig. 1, which is designed to rough and finish in one pass. The tool is made from a standard $\frac{3}{4}$ -inch square turning tool having standard clearances, with one end of the tool



Portable "burning buggy" designed to facilitate carrying of acetylene cutting equipment.

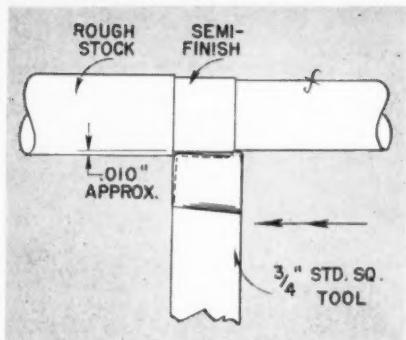


Fig. 1—Sketch of combination tool designed to rough and finish turn piece in one pass.

ground to provide a step of approximately 0.010 inch, as indicated.

Figure 2 shows the suggested method for grinding the step in the tool. The clearance angle is first ground in the tool, then the tool is turned to grind the cutting edge.

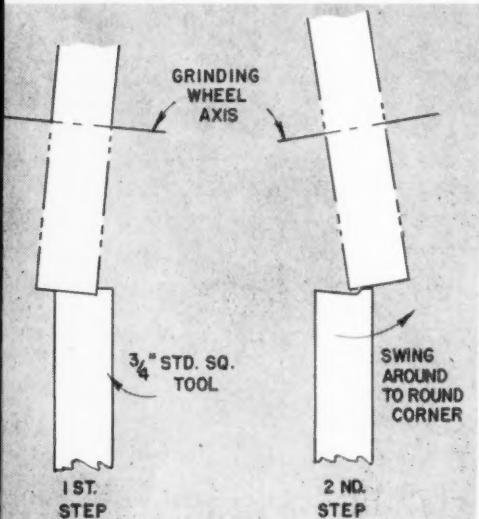
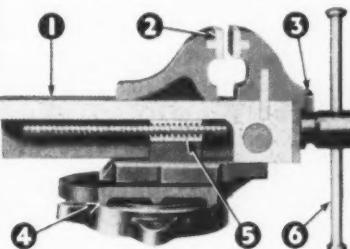


Fig. 2—Sketch showing suggested method for grinding step in end of combination tool.

VISE FEATURES

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4. positive locking 360° swivel base
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The Desmond-Stephan Mfg. Co.
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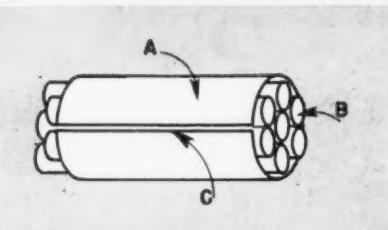
modern machine shop 167

ideas from readers . . .

Economical Method for Facing Shafts to Length

By LAURENCE H. SEIBERT

The job of facing thousands of short round rods to accurate length after sawing can be difficult to perform if tooling costs are to be kept to an absolute minimum. Referring to the accompanying sketch, a simple way of doing this job economically is to select or machine a length of tubing, *A*, into which seven of the rods, *B*, will fit snugly. The tubing is slit down one side, as shown at *C*, and the tubing with inserted rods is clamped in a three-jaw universal lathe chuck.



Sketch showing simple method for accurately facing several shafts to length at one time.

Tightening the chuck jaws compresses the tube so that the rods are held firmly for a facing cut. Reversing the tube in the chuck and placing it against a stop permits a final facing cut to be taken to establish an exact length. Rods can be readily deburred by means of any fast method, such as abrasive tumbling.

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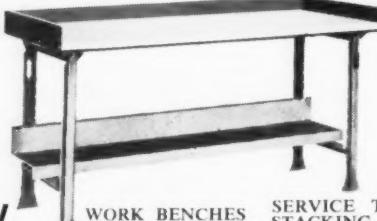
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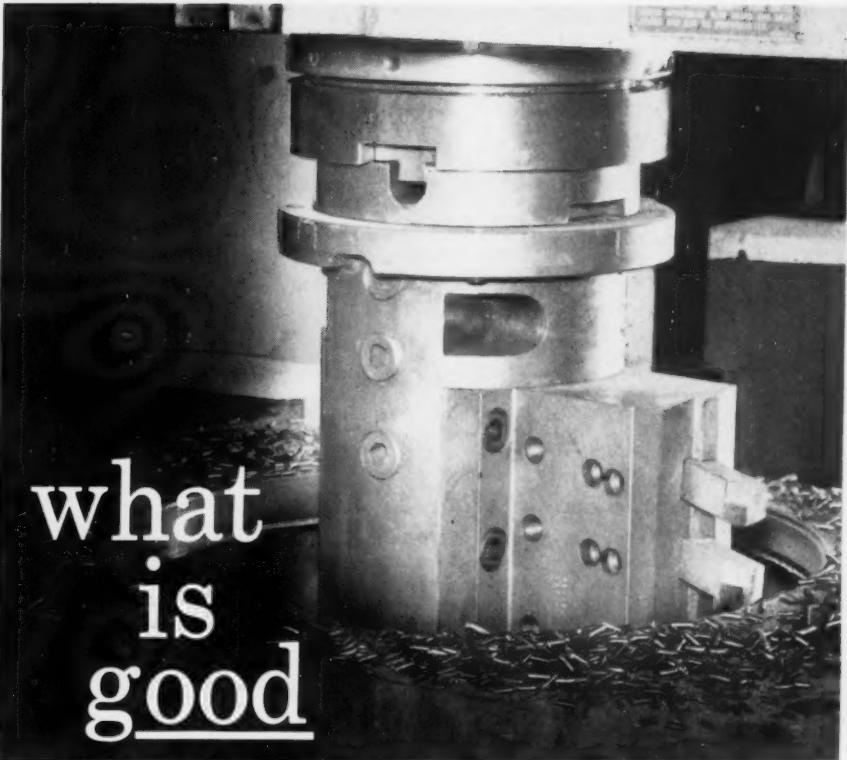
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We would welcome the opportunity to tell you more about this unique cutter selection service. Write:

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This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No. 684.



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free literature

**Use Postpaid Cards opposite page 32
and inside back cover for requesting
free copies of literature listed below.**

Adjustable Countersink

Madison-Relco Tool Co., P. O. Box 1137, Providence, R. I. Four-page two-color bulletin describes and illustrates new adjustable type countersink available in 15 models; also seven sizes of adjustable chamfering tools.

For more data circle 6 on Postpaid Card

Shape Cutting Machine

Linde Co., Room 2840, 420 Lexington Ave., New York 17, N. Y. Bulletin F-1294 is an eight page booklet that describes a fully automated flame cutting machine, for reproducing tens or thousands of intricate metal parts from simple pencil sketches on ordinary paper.

For more data circle 7 on Postpaid Card

Shock and Vibration Isolators

Barry Controls, Inc., 783 Pleasant St., Watertown 72, Mass. Bulletin 59-04 tells how to choose Barry Shock and Vibration Isolators to isolate vibration, attenuate noise or reduce shock.

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Carbide End Mills

Kennametal, Inc., Latrobe, Pa. Twelve page catalog on solid carbide end mills that are available in 15 different styles from solid bars of Kennametal tungsten carbide.

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Turret Drilling Machine

Brown and Sharpe Turret Drilling Division, Inc., 20 Fitch St., East Norwalk, Conn. Catalog No. 1T contains features of design and construction of the company's new turret drilling machines and work positioning tables.

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Threaded Fasteners

Standard Pressed Steel Co., Box 556, Jenkintown, Pa. Long Thread Engagement Folder provides a unique set of charts that tell at a glance how much screw thread pitch diameter tolerance is consumed in increasing lengths of engagement.

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Multi-Purpose Tool

James Engineering and Machinery Co. (Jemco), 2451 Monroe Boulevard, Dearborn, Mich. Four page bulletin describes and illustrates the company's multi-purpose Micro-Tool that features dual dial control, maximum rigidity, low original cost and low replacement cost.

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Materials Handling Equipment

Syntron Co., 309 Lexington Ave., Homer City, Pa. Condensed catalog of materials handling equipment, parts handling equipment, power rectification equipment, mechanical shaft seals, paper joggers and portable power tools.

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Marking Machines and Tools

The Acromark Co., 9 Morrell St., Elizabeth 4, N. J. Condensed pocket size catalog with complete price list provides data on steel and metal marking machines and tools, as well as various other related items.

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Milling Cutters

Aber Engineering Works, Waterford, Wis. This 24 page catalog gives detailed data on milling with Aber Cutters.

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Dust and Mist Collectors

Aget Manufacturing Co., 1398 East Church St., Adrian, Mich. All basic information needed to select the most efficient dust or mist collector for the job is included in this new brochure. **For more data circle 16 on Postpaid Card**

Carbide Tools

Metal Carbides Corp., Youngstown, Ohio. Catalog 59-G covers a complete line, including brazed tools and tips, Klamp-Lok Toolholders, throw away blanks, centerless blades, rolling mill rolls, heavy metal and technical data regarding the proper applications of Talide metal to cutting, drawing and wear resistant applications.

For more data circle 17 on Postpaid Card

Clamping Device

Simmons Fastener Corporation, North Broadway, Albany 1, N. Y. Data sheet describes Clamp-Lock, a compactly designed, high strength clamping device for quick and easy assembly and disassembly of rooms and buildings of flanged panel construction.

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Wire Rope

Jones and Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa. Seven products of the Wire Rope Division are described in five separate, four page pamphlets. These are: Center-fit Wire Rope; Cable Laid Slings; PlastiKore and SpringKore Wire Rope; JalKlamp and JalLoc Slings and Oil Field Manila Rope.

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Gages

Comtor Co., 64 Farwell St., Waltham 54, Mass. Bulletin 50 describes the Comtor-plug, which is designed for holes $\frac{1}{8}$ to 10 inches in diameter.

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Self-Locking Inserts

J. B. Plevyak Manufacturing Co., 19 Jefferson St., Newton, N. J. Flyer gives the features of Perma-Lock Inserts that are self-riveting and self-locking. They are designed for sheet metal and non-metal sheet applications.

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Leader Pins and Bushings

Bard Manufacturing Co., Royersford, Pa. This pamphlet gives size and price information on hardened and ground leader pins and bushings.

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Bearing Products

Boston Gear Works, 68 Hayward St., Quincy 71, Mass. Catalog No. 57 lists a complete line of bearing products.

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Roller Clutch for Presses

Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22, Calif. Flyer introduces the Kenco Cyclo-Safe Roller Clutch for all Kenco Presses; 2, 5, 8 and 15 ton capacity.

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Hydraulic Grinders

Olivetti Corporation of America, Machine Tool Division, 42-33 Northern Boulevard, Long Island City 1, N. Y. This 22 page brochure contains information on automatic hydraulic grinding machines (R4), which are available in three types — universal, production and plunge grinding types.

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Center Finder

Precision Gage and Tool Co., 320 East Third St., Dayton 2, Ohio. Catalog and price list for the Schwieterman Center Finder for use on jig borers, vertical mills, milling and similar machines.

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Live Centers

J and S Tool Co., Inc., 871 Dorsa Ave., Livingston, N. J. Twelve page folder describes a complete line of live centers. Folder contains illustrations, diagrams and specifications.

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Ovens

Trent, Inc., 211 Leverington Ave., Philadelphia 27, Pa. Three page Catalog SS-71-TF-1 describes the advantages of a new basic oven, the COF, for controlled heating processes up to 650 degrees F.

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Carbon Steel Tubing

Babcock and Wilcox Co., Tubular Products Division, Beaver Falls, Pa. Folder TDC-142B is a four page bulletin that furnishes condensed data on the mechanical and physical properties of seamless and welded carbon steel pressure tubing.

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Buffers and Grinders

Brown-Brockmeyer Co., Dayton 1, Ohio. Bulletin No. 10000 describes and illustrates the company's Tool Line Grinders and Buffers.

Specifications and prices included.

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Valve Bases

Hannifin Co., Department 166, 565 Wolf Rd., Des Plaines, Ill. Bulletin 235 covers alternate bases and the integral speed control section for Hannifin Series CC Four Way Air Valves.

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Clamping Tools

Wilton Tool Manufacturing Co., Inc., Schiller Park, Ill. Production know-how manual shows in-plant photos and operating case histories of how Wilton Clamping Tools have been used to save production time and money.

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Hardened Ways

Ohio Knife Co., Department HH-97, Cincinnati 23, Ohio. Catalog contains the latest information and stock specifications of standard ways and aluminum-bronze ways.

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Automatic Production Presses

The Minster Machine Co., Minster, Ohio. Minster Presses for automatic production of metal stampings are described and illustrated in a new 12 page, two color bulletin.

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Drill Press

Homestrand, Inc., Larchmont, N. Y. Brochure describes the new Arboga Drill Press, Type EV-10, with infinitely variable speed.

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Torque Wrenches

P. A. Sturtevant Co., Addison, Ill. This torque wrench manual provides formulas, applications, engineering data, screw torque data, adapter problems and general principles.

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Aluminum Bronze Bars

Johnson Bronze Co., New Castle, Pa. Four page, two color folder describes

aluminum bronze bars. It outlines the advantages of both solid and centrifugally-cast cored bars, available in standard 12½ inch lengths and in sizes up to 8 inches outside diameter.

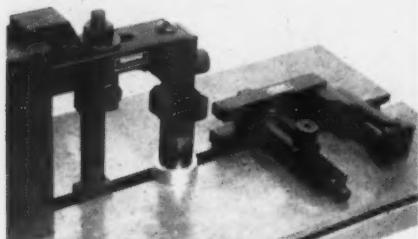
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Centerless Grinder

Norton Co., Machine Division, Worcester 6, Mass. Catalog No. 1328 presents the No. 2 straddle bearing centerless grinder, built for speed, accuracy and economy.

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Detroit 38, Mich.

Recessing Tools

Maxwell Industries, Inc., 493 East Fifth Ave., Ashtabula, Ohio. Convenient guide for specifying recessing tools to help tool engineers, shop foremen, production engineers or machine shop owners diagram and explain the machining operations.

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Copy Shaper

Mercuria Co., 156 Burlington Ave., Clarendon Hills, Ill. Flyer describes and illustrates the Type RK Hydraulically Operated Copy Shaper.

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Indexing Units

Standard Tool and Manufacturing Co., 237 Laurel Ave., Kearny, N. J. Bulletin features cam operated indexing units. Included are drawings, tables of indexing positions and cams, results of accuracy tests and dimensions of standard tooling and dial plates.

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Die Filers and Profile Grinders

Rice Pump and Machine Co., Belgium, Wis. Catalog contains data on die filers and profile grinders, designed to cut tooling costs in filing, sawing, lapping and grinding work, and sprue cutters for non-ferrous foundries.

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Copper, Brass and Bronze Alloys

Bridgeport Brass Co., 30 Grand St., Bridgeport, Conn. This folder was designed to assist in the selection of copper based alloys for particular products and processes to effect savings in raw material costs and to improve production operations.

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International Inch

Pratt and Whitney Co., Inc., 29 Charter Oak Boulevard, West Hartford, Conn. Booklet discusses, on a practical, common-sense basis, the various problems a manufacturer can be expected to encounter as a result of America's changeover to the International Inch.

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Cut-Off Saw

Production Machinery, Inc., Post Office Box 322, Oakton Station, Des Plaines, Ill. Four page, two color bulletin describes the Promacut Multi-Purpose Cut-Off Saw.

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Dial Indicators

Federal Products Corp., 9147 Eddy St., Providence 1, R. I. Four page brochure describes the Federal Miracle Movement Dial Indicator.

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Dust Control Equipment

Torit Manufacturing Co., Walnut and Exchange Sts., Department 712, St. Paul 2, Minn. New data and information on 99 plus percent dust control with Torit Cabinet Cloth Filter Dust Collectors.

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Abrasive Snagging Wheels

Simonds Abrasive Co., Tacony and Fraley Sts., Philadelphia 37, Pa. Catalog describes regular resinoid and vitrified bonded abrasive snagging wheels for portable grinding machines.

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Furnaces

Hevi-Duty Electric Co., Milwaukee 1, Wis. Bulletin 459 gives data on furnaces, for transistor and semi-conductor industries. They provide temperatures to 2,600 degrees Fahrenheit.

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Machine Shop Training Course

Chicago Technical College, 2000 South Michigan Ave., Chicago 16, Ill. Brochure gives detailed information on this new machine shop training course that is

being offered by Chicago Tech. See article in the "News of the Industry" section on Page 185.

For more data circle 50 on Postpaid Card

Hydraulic Valves

Rivett, Inc., Brighton 35, Boston, Mass. Manual No. 230 illustrates and describes the operation and application of pressure controlled hydraulic valves.

For more data circle 51 on Postpaid Card

Milling Cutters and End Mills

Illinois Tool Works, Tool and Instrument Division, 2501 North Keeler Ave., Chicago 39, Ill. A complete selection of Illinois standard end mills and milling cutters is listed in Consumer Price Catalog No. 105.

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Steel Equipment

Equipto, Aurora, Ill. Reference manual for steel equipment (No. 487) covers such subjects as slotted angle, mezzanine and floor grating, shelf filing and large drawer units.

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Collet Adapters

Tree Tool and Die Works, Racine, Wis. Four page bulletin illustrates and describes the Rapid-Lok Collet Adapter, designed for speed, accuracy and maximum holding power.

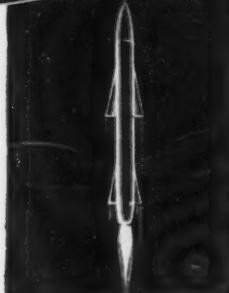
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Sandblast Nozzles

Diamonite Products Manufacturing Co., Shreve, Ohio. Features of Diamonite Double L Sandblast Nozzles are graphically described in this two color brochure.

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System of Joint Preparation

Wallace Supplies Manufacturing Co., 1804 West Cornelia Ave., Chicago 13, Ill. Brochure provides complete information on the De Witt System for low cost tubular joint preparation.

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Layout Fluid

Dayton Rogers Manufacturing Co., Minneapolis 7D, Minn. Flyer describes an improved layout fluid for any metal, which is available in an assortment of colors.

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Conversion Chart

Clark Instrument, Inc., 10204 Ford Rd., Dearborn, Mich. Chart gives approximate conversions for heat treated steel, unhardened steel, cast iron and non-ferrous metals; Rockwell, Vickers, Brinell and Shore scales.

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Spiral Point Drill

Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio. Catalog SP-165 is a 24 page booklet that describes spiral point geometry for converting standard twist drills into precision tools.

For more data circle 59 on Postpaid Card

Die Springs

The Products Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn. Detailed catalog insert page tells about three new diameters of 37 percent deflection medium high pressure chrome-vanadium steel die springs.

For more data circle 60 on Postpaid Card

Metallizing Equipment

Metallizing Engineering Co., Inc., 1177 Prospect Ave., Westbury, Long Island, N. Y. Bulletin tells how a metallizing installation can pay for itself in a very short time.

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Clamping Systems

Newton Hydraulic Tooling Co., Auburn, Mass. Catalog, with full scale templates provided, tells about the Newton Hydraulic Clamping System of pumps, cylinders and mounting parts.

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Stuart's new **Hi-D**

transparent metalworking compound

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Centerless Grinding

Carborundum Co., Niagara Falls, N. Y. Booklet presents information on the centerless grinding of metallic and non-metallic materials. It points out how to select the proper abrasive.

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Safety Glasses

Bausch and Lomb Optical Co., 893 St. Paul St., Rochester 2, N. Y. This four

page, two color bulletin presents the M-70 Metal Frame Safety Glasses, that feature an expansion type endpiece that allows easy assembly of lenses and side shields.

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Tool Bits

The duMont Corp., Greenfield, Mass. Tool bit comparison chart, catalog and price list concerning duMont Tool Bits that are balanced in toughness, red hardness and wear resistance.

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Stock Pushers

Rigid Products Co., Post Office Box No. 162, Cincinnati 15, Ohio. Four page bulletin on Rigid One Way Stock Pushers, designed to save on pusher costs, scratched work, short work and machine maintenance.

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20 Inch Band Saw

Rockwell Manufacturing Co., Delta Power Tool Division, 606H North Lexington Ave., Pittsburgh 8, Pa. Two color, eight page, illustrated bulletin describes the Delta 20 Inch Metal-Wood Cutting Band Saw.

For more data circle 67 on Postpaid Card

Balancing Machines

Bear Manufacturing Co., Industrial Division, Rock Island, Ill. Catalog and four new data sheets describe and illustrate the new line of Bear Bekomatic Production Line Dynamic and Static Balancing Machines.

For more data circle 68 on Postpaid Card

Cylindrical Grinder

Van Norman Machine Co., Springfield 7, Mass. Six page, two color bulletin presents the 418 Plain Cylindrical Grinder, every feature of which has been completely engineered to give accurate heavy machine performance.

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Die Blanks

Simonds-Worden-White Co., 1101 Negley Place, Dayton 7, Ohio. Bulletin describes and illustrates four new types of composite tool steel die blanks for manufacturing, piercing, blanking and forming dies.

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Grinding Wheels

The Blanchard Machine Co., 64 State St., Cambridge 39, Mass. "The Art of Blanchard Surface Grinding" (Fourth Edition) provides information on surface grinders, grinding wheels and segments.

For more data circle 71 on Postpaid Card

Melting Process

Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa. Eight page brochure describes the company's new Hopkins Process (Stercon H), technique for producing high purity metals.

For more data circle 72 on Postpaid Card

Hack Saws

Armstrong - Blum Manufacturing Co., 5700 Bloomingdale Ave., Chicago 39, Ill. Catalog C85 has complete details, facts and figures on both Marvel metal cutting hack saws and band saws.

For more data circle 73 on Postpaid Card

Arbor Presses

K. R. Wilson, Inc., Arcade, N. Y. Illustrated Bulletin 104-A0 presents KRW's new 10 ton hand operated hydraulic bench arbor press.

For more data circle 74 on Postpaid Card

Duplicator

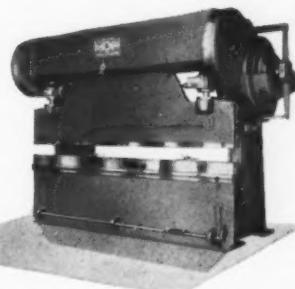
George Gorton Machine Co., 1706 Racine St., Racine, Wis. Bulletin 2968 presents the "Auto-Trace" Electro-Hydraulic Series Duplicator with 180 degree automatic tracer.

For more data circle 75 on Postpaid Card

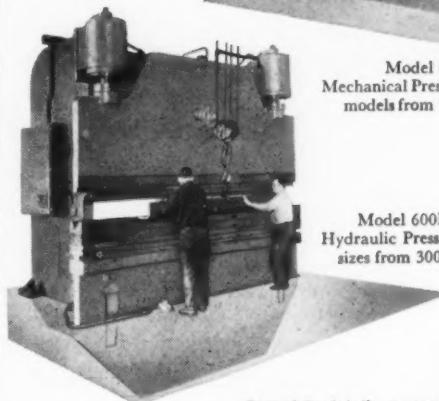
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Power Presses

Johnson Machine and Press Corp., 620 West Indiana Ave., Elkhart, Ind. Catalog No. 59 charts information on the complete Johnson Power Press line.

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Toolroom Lathes

Hardinge Brothers, Inc., Elmira, N. Y. Bulletin HLV describes a toolroom lathe that features extreme accuracy, high spindle speeds and ease of operation.

For more data circle 77 on Postpaid Card

Power Shears

Famco Machine Co., 3122 Sheridan Rd., Kenosha 7, Wis. Informative bulletin illustrates and describes the Hi-Speed Power Shear Line.

For more data circle 78 on Postpaid Card

Hydraulic Power Package

Owatonna Tool Co., N. Cedar St., Owatonna, Minn. Bulletin describes a two-stage hydraulic power package which delivers from 600 cubic inches of oil a minute at 100 p.s.i. to 50 cubic inches of oil a minute at 10,000 p.s.i.

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Blanchester, Ohio

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news of the industry

**New plants and expansions . . . services . . .
acquisitions . . . anniversaries . . . awards**

Edited by L. L. BALDHOFF

BARRY CONTROLS ACQUIRES WEST POINT MANUFACTURING COMPANY

Barry Controls, Inc., Watertown, Massachusetts, has announced an agreement to purchase certain assets and the going business of West Point Manufacturing Company, Detroit, Michigan. The acquisition is to be made through Vlier Engineering Corporation, Los Angeles, California, a subsidiary of Barry Controls.

The business will be operated as the Wespo Division of Vlier Engineering Corporation, bringing together two respected names in the manufacture of expendable tooling accessories designed expressly for the metal-working industry.

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TEN FIRMS HONORED FOR OUTSTANDING ACHIEVEMENT IN GEAR PRODUCTION

Ten plants in eight industries and nine cities in the United States have been awarded 1959 Honor Citations for "excellence in gear production and effective use of modern gear production equipment." Receiving the awards were two plants of automobile manufacturers, one in the electric motor field, a producer of farm tractors, a

manufacturer of road building and construction equipment, a printing equipment manufacturer, a producer of ship propulsion equipment, an outboard motor manufacturer and two



Looking over one of the processes which earned Rockwell-Standard a 1959 Honor Citation for excellence in gear production techniques are (left to right) Newark plant officials H. D. Benson, general superintendent; J. G. Walkinspaw, gear technician; R. J. Crumet, general foreman; Harry Pelphrey, director of research of Michigan Tool Company, Detroit, sponsor of the awards; William E. St. Clair, general manager of the Newark plant; H. E. Kranning, assistant general manager; and W. H. Emery, assistant general superintendent. The machine, a Michigan "rack shaver", produces an undercut in a heavy duty transmission gear, which prevents gears from coming out of mesh accidentally.

independent producers of subassemblies of the commercial and military vehicle field.

These awards are sponsored annually by the Michigan Tool Company, Detroit, Michigan, producer of a complete line of gear production equipment.

The winning plants, along with the individuals named by the companies to receive the awards in behalf of the plants, were: Caterpillar Tractor Company, Peoria, Illinois Plant (E. L. Naumann); Chrysler Corporation, Kokomo, Indiana Plant (James Cypher); Dana Corporation, Toledo, Ohio Division (John H. Jones); Evinrude Motors Division, Milwaukee, Wisconsin (C. E. Kopp); Ford Motor Company, Transmission Division, Livonia, Michigan (R. L. McNulty); General Electric Company, River Works Plant, Lynn, Massachusetts (J. E. Anderson); International Harvester Company, Farmall Works, Rock Island, Illinois (Paul Bohy); Miller Printing Machinery Company, Pittsburgh, Pennsylvania (E. H. Sieg); Rockwell-Standard Corporation, Newark, Ohio Plant (W.

Clair); and Westinghouse Electric Corporation, Nuttall Works, Pittsburgh, Pa. (F. D. Weatherholt).

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EX-CELL-O CORPORATION CELEBRATES 40TH ANNIVERSARY

A small group of Detroit toolmakers formed a company in 1919 to produce parts to standards of precision that

THE TRUTH ABOUT...

MARSHALL LEADERSHIP

SPECIALISTS IN PREPARED TOOL STEELS

LEADERSHIP, like reputation, is earned by striving for perfection and by the consistent delivery of quality-controlled products. "He profits most who serves best".

LEADERSHIP is often copied—but never equaled! Marshall Steel Company makes available the largest stocks of Ground Flat Tool Steel on the market in three types:—

Oilcrat: A fine grained electric furnace tool steel, oil hardening (S.A.E. 0-1 Tungsten Type) Analysis.

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MARSHALLCrat: Low Carbon, silicon killed 1018, high-quality carbon steel. (Can be case-hardened or carburized)

Each of these 3 grades are metallurgically correct for proper heat treating...truly...The ARIS-TOCKATS OF GROUND FLAT STOCK.

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were beyond the capabilities of most plants at that time. That was the start of Ex-Cell-O Corporation, which today has 29 plants throughout the industrial areas of the United States, Canada, England, Germany and India.

An aggressive program of expansion has resulted in the building of several new plants and the acquisition of

subsidiaries in the United States, Canada and overseas. From an original floor area of only 2,375 square feet, the combined capacity today of all the company's plants totals over 2½ million square feet.

Within the broad fields of machine tool building, cutting tool manufacture, precision parts production and serving the dairy industry, Ex-Cell-O's highly diversified facilities stand ready to meet the challenge occasioned by

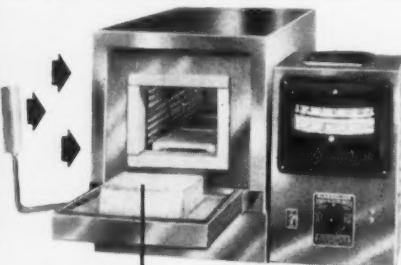
the increased use of automation and by the technical advances yet to be made in the field of rockets, missiles, space travel vehicles and nucleonics.

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STAINLESS STEEL CONSTRUCTION

Electronic Instrumentation plus Power Selector Switch permit automatic setting and control of all temperatures within range. Unaffected by ambient or voltage changes, these incomparable models speed up ash determinations, fusions, incinerations, ignition of precipitates, heat treatment of glass, ferrous/non-ferrous metals.

- Modella Elements—4 Sides
- Quality Refractories
- Complete—Ready to Use

Model E-514 Furnace, 5½" x 10" x 4½" (I.D.), 18½" x 17½" x 15" (O.D.), 2000 Watts, 115V./60cy. A.C. \$439.00

Model E-514A Same for 230V./1 Ph./60cy. A.C. 439.00

Model E-555 Furnace 5½" x 15" x 4½" (I.D.), 18½" x 22½" x 15" (O.D.), 3450 Watts, 230V./1 Ph./60cy. A.C. 495.00



BULLETIN CP-123 AVAILABLE UPON REQUEST

BLUE M Electric Company BLUE ISLAND, ILL.

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COMPLETE TEMPERATURE CONTROL EQUIPMENT

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with

AUTOMATIC
Electronic
Indicator
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HI-DUTY EXPANDS FACILITIES

Hi-Duty Drill Works, a division of Hi-Duty Industries, Inc., Fleetwood, Pennsylvania, is in the process of expanding its office and plant facilities in order to meet the demands for its line of flat twisted high speed drills.

This extensive expansion program will be spread over a period of ten years and will include a complete retooling of the machinery of the plant.

LOWELL WRENCH COMPANY MOVES TO NEW PLANT

Lowell Wrench Company, manufacturer of ratchet wrenches, recently celebrated its nineteenth anniversary by holding the ribbon cutting ceremony and plant tour in its new building, located at 97 Temple Street, Worcester, Massachusetts.

On display were some of the first wrenches manufactured in 1869, together with their modern counterparts. Also shown were many unique wrenches being made today, having such features as hinged handles, non-sparking bronze, light weight aluminum and end-of-handle reversing knob. Specially featured was a giant six foot ratchet wrench, capable of over 100,000 pounds of torque.

★ mms ★

WILLIAM H. GALLMEYER

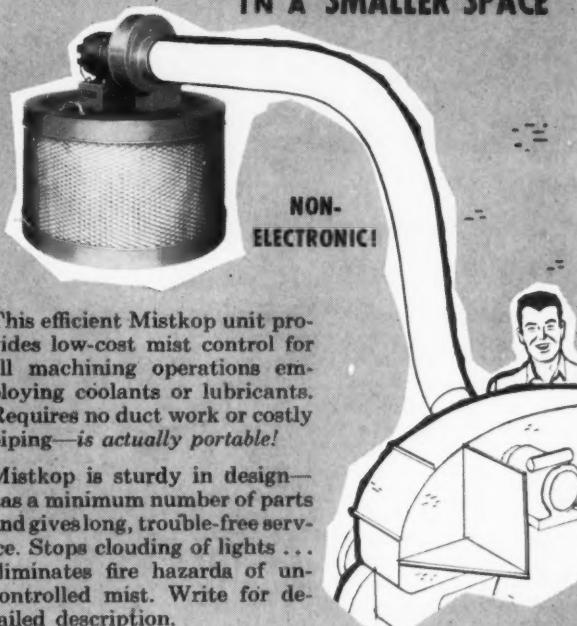
Gallmeyer and Livingston Company, Grand Rapids, Michigan, has announced the death of William H. Gallmeyer, President and Treasurer. Mr. Gallmeyer, 76, who died of a heart attack, had been president since 1948.

NEW COURSE DESIGNED FOR MACHINE SHOP WORKERS

Chicago Technical College, 2000 South Michigan Avenue, Chicago 16, Illinois, has recently added to its home study curriculum a new course in machine shop training for apprentice machinists, machine operators and so on. The course includes shop mathematics, blue print reading, precision measurement, job layout, bench-

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This efficient Mistkop unit provides low-cost mist control for all machining operations employing coolants or lubricants. Requires no duct work or costly piping—is actually portable!

Mistkop is sturdy in design—has a minimum number of parts and gives long, trouble-free service. Stops clouding of lights... eliminates fire hazards of uncontrolled mist. Write for detailed description.

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news of the industry . . .

work and machine tool setup and operation. Subject material, essential for the position of Master Machinist, is based upon actual shop practice and is thoroughly covered in an interesting and practical manner.

Training directors and members of apprenticeship committees may write the Chicago Technical College at the address above for information on group enrollment plan for employees.

**FLICK-REEDY CORPORATION
OPENS NEW PLANT**

Flick-Reedy Corporation, Bensenville, Illinois, has announced the opening of its new \$2,300,000 plant, located at York and Thorndale Roads, just west of Chicago's O'Hare Airport.

The plant will be heated in winter and cooled in summer by an air-source heat pump, designed and built by the York Division, Borg-Warner Corporation, Chicago. This heat pump is said to be the largest installation of its type

in the world and can extract sufficient heat from even subfreezing air to heat a large industrial plant. In summer the cycle of the pump is reversed to provide air conditioning by pumping heat from inside the building to the outside air.

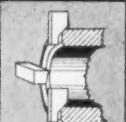
The new plant has a regulation size swimming pool for its employees and three man-made lagoons to provide water for all of its industrial purposes.

Another feature of this new facility is the 70 by 100 foot auditorium, which is used for employee gatherings, sales meetings, parties and employee recreation. The auditorium features a design

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cuts costs**
ON TUBE AND ROD

✓ DEBURRING
✓ CHAMFERING
✓ FACING, POINTING

Here is the machine that eliminates the need for tying up expensive lathes and screw machines for deburring rods and tubes, and it profitably replaces such costly methods as hand rolling pieces against a sanding belt or holding them against a rotating brush. The Pines End-Finishing Machine is *fast* and *accurate*. It squares the end, removes all the burr from the inside, and makes a uniform, accurate chamfer on the outside. Women operators commonly deburr up to 800 1-inch tubes per hour. It clamps, feeds, finishes in one motion — leaves one hand free for stock handling. Machine illustrated handles stock up to 2" O.D. Automatic air-clamping units and models for stock up to 5" also available.



Handles deburring, chamfering, facing operations simultaneously.

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interchangeable with all
standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from $1\frac{1}{2}$ to 8 inches, the T-J Squair Head is an interchangeable

cylinder which produces maximum force and efficiency, with minimum pressures... and is also adaptable to the use of low pressure oil as the working medium. Write today to Tomkins-Johnson, Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1. One Piece Piston
2. Hard Chrome Cylinder Bore and Piston Rods
3. High Tensile Steel Tie-Rods
4. Cushion Adjusting Screw, Externally Adjustable
5. New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)
6. Solid Steel Heads and Mounting Plates Standard all Models
7. Port Design Allows Minimum Pressure Drop on Inlet or Outlet
8. Chevron Type, Self-Adjusting Rod Packing
9. Piloted Packing Gland—Absolute Alignment
10. Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

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September, 1959

modern machine shop 187

T-J
TOMKINS-JOHNSON
ESTD. 1848 JEWELL, ILLINOIS

news of the industry . . .



Shown above is the new plant of the Flick-Reedy Corporation, Bensenville, Illinois

in the floor of volleyball, badminton and shuffleboard courts for the benefit of employees and their families.

Flick-Reedy Corporation produces a complete line of industrial hydraulic and air cylinders and pipe-thread sealing nuts.

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MOTCH AND MERRYWEATHER ACQUIRES TWO COMPANIES

The Motch and Merryweather Machinery Company, Cleveland, Ohio, has announced the purchase of Modern Tool Corporation and Radial Cutter Manufacturing Corporation of Elizabeth, New Jersey. Both companies are engaged in the manufacture and sale of carbide tipped circular saw blades for a wide variety of applications, including ferrous and non-

ferrous metals, plastics and wood products. Plant facilities will be moved to Cleveland and made a part of the company's Cutting Tool Manufacturing Division.

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SCULLY-JONES FORMS RESEARCH AND DEVELOPMENT CORPORATION

The formation of the Scully-Anthony Corporation, 4707 Willow Springs Road, La Grange, Illinois, was recently announced by Scully-Jones and Company, Chicago, Illinois. This is to be a research and development subsidiary, whose function will be to increase product and market versatility through the development of various types of new products in both the electronic and electro-mechanical fields.



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Types include: box, barrel, side, index, face as well as hardened and ground with bore and shapes exactly to your specifications. Also rotary profiling. Outline your needs.

THE ROWBOTTOM MACHINE CO.

Waterbury, Connecticut

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A New Superior Gage Block, "A+" $^{+.00004}$
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Priced lower than former "A" and "B" sets.

These new blocks actually exceed U. S. Bureau of Standards or Federal specifications for Grade "A" blocks. Yet WEBBER has priced them even lower than now obsolete "B" blocks!

A COMPLETE \$287⁵⁰
84 block set only

including two .100 Croblox (chrome carbide) wear blocks.

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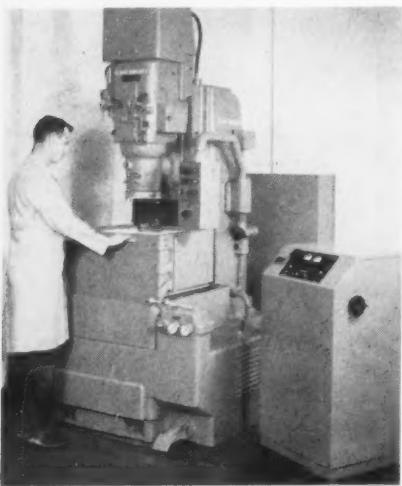
new shop equipment

**Descriptions of new machines, tools
and materials for metalworking.**

ELECTRICAL DISCHARGE MACHINE TOOLS

An Elektrojet line of electrical discharge machine tools, just announced by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, is specifically designed to solve problems in the areas of close tolerances, economical electrodes, big cavities, and in general give the dependable performance one expects of quality machine tools.

The basic Elektrojet line consists of



**Elektrojet Machine equipped with Universal
workhead, movable slide and drop-front tank**

a single base and column on which may be mounted four interchangeable workheads and four different base-tank units. The choices of workheads are:

1. Non-rotating—For operations such as die sinking, in which the desired shape is produced by the vertical feed of a formed electrode.
2. Rotating—For operations in which a revolving electrode is desired. Generally, rotation of the electrode as it feeds into the workpiece gives improved machining conditions which result in increased stock removal rates. On this workhead, the spindle rotation can be stopped and the quill feed alone used for plunge-type cuts.
3. Universal—In addition to quill feed and electrode rotation, this workhead is also designed to provide eccentric or planetary rotation to the spindle. The planetary motion, comparable to that of a jig grinder, makes it possible to produce precise holes using an electrode smaller than the hole, and simplifies the machining of internal contours and annular grooves.
4. Ram-type — For extra large plunging cuts, typical of those required in the manufacture of

and shop materials

Edited by L. L. BALDHOFF

new
shop
materials

forging and drawing dies, in which the cavity has a large surface area.

Each of these workheads may be matched with any of four tanks, for holding the dielectric:

1. Solid tank—For small easily clamped workpieces machined in production quantities.
2. Open-front tank—For greater accessibility. The front panel on this tank can be lowered to make it easier to load and position parts.
3. Disappearing tank—The entire tank can be lowered into the bed of the machine by turning a handwheel, thus making the workpiece accessible from all sides, a distinct advantage with large workpieces.
4. Moving table tank—The tank is mounted on slides giving it a wide range of longitudinal and transverse movement, controlled by hand wheels. The movable table makes it easy to locate the workpiece under the electrode, and in combination with the rotating or universal workheads creates a highly versatile machine. This table may also be equipped with servo drives to move it under the electrode at a controlled rate.

Fixed and adjustable workhead

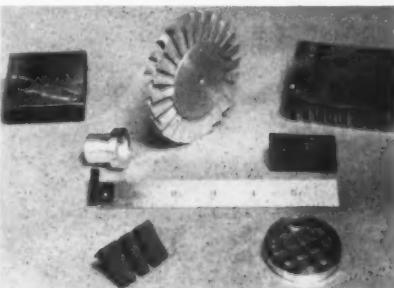
slides are also offered and a choice of 20, 40 and 60 ampere and 100 ampere power supplies.

The line is rounded out by two electrical discharge grinding machines, and a heavy duty electrospark diesinking machine.

The diesinker is built with a larger base and column size than the basic line. It is equipped with a ram-type workhead, disappearing tank, and is designed particularly for heavy-duty die work on blocks measuring up to 18 inches thick.

The many building block components developed for the standard line also add great flexibility to Cincinnati's ability to provide special electrical discharge machines.

For more data circle 80 on Postpaid Card



This illustration shows some typical work performed on Elektrojet machines.

new shop equipment . . .

VERTICAL MULTI-ROLLER RADIAL FLOTURN

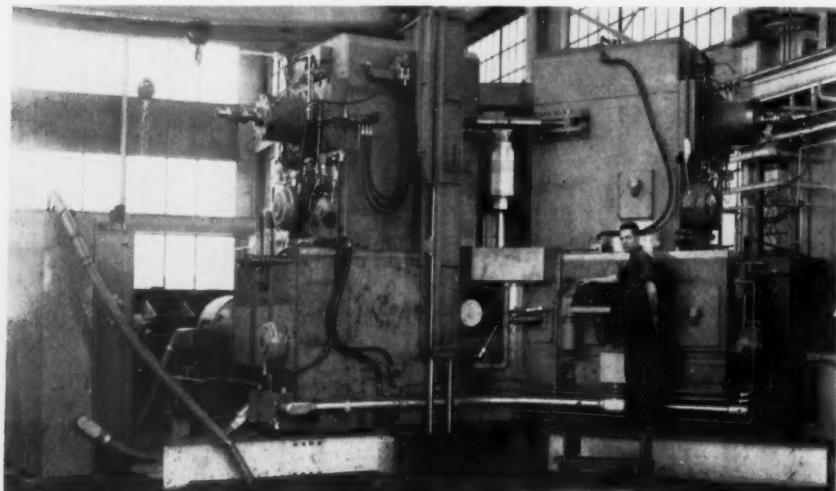
The solution to many of the problems involved in the production of rocket and missile bodies will be found in the application of the Multi-Roller Radial Floturn machine which has been placed on the market by the Floturn Division of Lodge & Shipley Company, 3058 Colerain Ave., Cincinnati 25, Ohio. This massive machine, a view of which is shown herewith, is designed for the production, from simple "blanks," of large diameter (up to 60 inches) thin-wall cylinders with lengths up to 30 feet and longer.

The base of the Multi-Roller Radial Floturn is a substantial casting with a hexagonal bottom section and a triangular top section. The three roller stations are located on three alternate hexagon sides and abut the triangular shape. The drive occupies a fourth hexagon side, between two of the roller stations. The remaining two hexagon

sides are open, providing convenient operator stations.

The spindle, which rotates at a maximum of 300 r.p.m. and a minimum of 50 r.p.m., is supported by three bearings. The main radial bearing is a large spherical roller type bearing as used in rolling mill equipment. This bearing is backed up with a roller type thrust bearing. A third bearing located at the lower end of the spindle is a tapered roller bearing.

In order to eliminate the problem of a high pressure hydraulic connection to the rotating spindle, the entire hydraulic system pump, motor, and reservoir used for feeding the workpiece is contained in the spindle. This system operates at 1,500 p.s.i. The total feed force of approximately 75,000 lb. includes the force required to lift the tool, workpiece and associated mechanism, approximately 25,000 lb. at maximum tool size. Thus, actual feed force is 50,000 lb. or more, far in excess of maximum requirements. The reciprocating action of the feed mechanism (up to feed the workpiece and down to strip the workpiece



Overall view of the Lodge & Shipley Vertical Multi-Roller Radial Floturn Machine

from the tool) is guided by four large "keys" which key the tool to the rotating spindle. These keys act, at the same time, as tie rods to the hydraulic feed piston; they slide in key ways on the spindle and are attached to the tool. Suitable (replaceable) wear surfaces are provided.

The tool is an accurately machined, smoothly finished and hardened cylinder which is assembled to the spindle. Tool size depends on the workpiece being produced; the tool size is 36 inches long and from 25 to 60 inches in diameter. The tool O.D. determines the workpiece I.D. The lower circumference of the tool has a shoulder which holds bottom edge of work.

There are three roller carriages, at 120-degree intervals about the spindle. Each carriage is mounted on its individual bed which, in turn, is fastened to the main machine base and bolted to the foundation. Each carriage is provided with radial (in and out) adjustment to accommodate workpieces ranging from 25 to 60-inch O.D. and vertical adjustment; both adjustments can be securely locked. The radial adjustment brings the carriage to the proper position with respect to the size (diameter) of the workpiece. The vertical adjustment brings all three roller groups to the same horizontal plane.

In addition to the carriage adjustment, the roller yoke, which can be fitted with from one to five rollers, is adjustable through 10-degree of angle. This adjustment changes the "angle of attack" of the rollers. The machine is designed to take rollers of 17-inch maximum diameter.

When the roller carriages are correctly positioned, the circumferential tie rods between the roller stations are tightened. These locking devices assure accurate positioning of the roller carriages and allow application of maximum equalized roller pressures.

The spindle drive motor is 150 h.p., through a six-speed, hand operated

gear transmission. A suitable coupling is provided between the transmission and the bevel gears which transmit the power to the bull gear, which is in the 40-inch diameter range, minimizing the chances of vibration. Anti-friction bearings are used throughout the power transmission train.

The workpiece feed system, partially described under "spindle," is designed to lift the tool and consequently the workpiece smoothly at a rate infinitely variable from 0 to 20 inches per minute by controlling the hydraulic flow rate.

When the Floturn cycle is complete, stripping fingers are extended from each roller station, supporting the workpiece. When the tool is retracted, the workpiece is stripped off and held awaiting removal.

A pendant push button control, adjustable to either of the operating stations, is provided. All functions concerned with the Floturn cycle can be controlled from this station.

This Floturn machine is designed for application of tracer controls to



Overhead view of workpiece in position in Lodge & Shipley Multi-Roller Floturn Machine

new shop equipment . . .

each of the three roller stations. With this optional extra equipment, which includes a complete hydraulic tracer, movable template supports and hydraulic system, it is possible to Floturn a tapered wall cylinder or turn stiffening rings on the O.D. of part.

Another optional extra for the Multi-Roller Radial Floturn Machine is a 3-arm flanging attachment. When flanges are formed, the tool is stationary and the rollers are attached to the spindle. Either inside or outside, square-corner flanges may be formed. For more data circle 81 on Postpaid Card

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UNIT DESIGNED FOR MULTIPLE TESTING

Cincinnati Sub Zero Products, 3930-S-9 Reading Rd., Cincinnati 29, Ohio, announces the Model SV3-75-5, as illustrated, which was designed for multiple testing. Equipped with three



Cincinnati Model SV3-75-5 Low Temperature and Environmental Testing Equipment

stainless steel test cells, each having a net test area of 14 inches long by 14 wide by 14 deep, the following operation is provided.

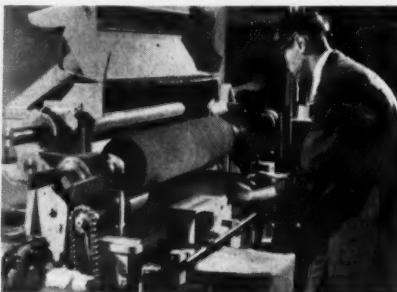
Test Cell "A" provides a test temperature adjustable from 0 to minus 20 degrees F.; Test Cell "B" from minus 35 to minus 45 and Test Cell "C" from minus 60 to minus 75. A cascade refrigeration system equipped with $\frac{3}{4}$ and 1 h.p. accessible hermetic motor compressors, provides the refrigeration for all three cells. Each compartment is individually controlled and operation is charted by individual recording thermometers. For minimum temperature variation, an 8 inch air circulator is provided for each area. Plexiglass inner lids cover each cell to minimize temperature loss and variation when adjoining cells are open. For more data circle 82 on Postpaid Card

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ABRASIVE WHEELS

A completely new form of abrasives—wheels and rolls of non-woven nylon fiber with abrasive grain dispersed throughout—appears to offer great promise in finishing and polishing in the metal, plastics, rubber and woodworking industries.

The new Bear wheels were developed by Behr-Manning Co., Dept. MS-7, Troy, N. Y. They seem best suited for such operations as cleaning, the devel-



One of the new, 38 inch wide Bear Wheels is shown above polishing a copper sheet

opment of decorative straight-line or swirl patterns and the imposition of matte finishes where high reflectance is undesirable. They are not designed for stock removal or even for normal grinding or deburring, although their action may be varied by changing the type and size of grit, modifying the resins used, altering the density of the wheel itself, varying the rate and extent of oscillation or changing pressures and speeds.

For more data circle 83 on Postpaid Card

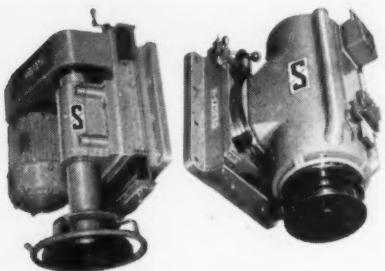
★ modern machine shop ★

ELECTROLYTIC SPINDLES

The Standard Electrical Tool Co., 2487 River Rd., Cincinnati 4, Ohio, announces Super Precision Spindles, whose horsepower and speed requirements vary from 1 to 20 h.p., 600 to 7,600 r.p.m., depending upon the character of work, size and type of wheel. In some instances, multiple speed on direct motor driven, or variable speed on belted motor drive delivers the versatility required. Design and construction of the spindle permits use of d.c. power supply, ranging from 50 to 3,000 amps.

Electrolytic metal removal is accomplished by d.c. delivered by a power supply that converts a.c. from an ordinary power source to low voltage, high amperage d.c.

For more data circle 84 on Postpaid Card



View of Standard Electrolytic Spindles

BELT AND DISC SANDER

A heavy duty 10 inch disc and 6 by 48 inch belt sander is introduced by Duro Metal Products Co., 2693 North Kildare Ave., Chicago, Ill. Disc can be operated with or without auxiliary work table and belt operates in either vertical or horizontal positions.

Equipped with ball bearings, it is made of cast construction with reinforced ribbing, for maximum rigidity without vibration. Large auxiliary work table with mitre gage can be tilted 45 degrees and is interchangeable for use with either belt or disc. A special preloading belt tensioning device permits fast changing of belts without time consuming retensioning and retracking. A quick release lever ejects worn belts in seconds. Forward end guard can be opened to permit operator to use end of drum for sanding curved objects. Handy fence assembly moves vertically across belt area in any degree up to 45 or can be set diagonally for across belt sanding.

For more data circle 85 on Postpaid Card



The Duro Disc and Belt Sanding Machine

Lead-Screw Threading and Tapping on GREENLEE AUTOMATICS



SAVES YOU
✓ **MONEY**
✓ **MAINTENANCE**

Lead-screw threading and tapping attachments for Greenlee Automatics make it easy to thread parts otherwise impractical for automatic bar machine operations. Smooth, precision threading with excellent finish make this type of operation profitable for you.

Look over the threaded products at the right . . . then ask your Greenlee Representative to show you this and other ways Greenlee Automatics can help you beat rising production costs.

WRITE
FOR
CATALOG
A-405



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GREENLEE BROS. & CO.
1750 MASON AVENUE
ROCKFORD, ILLINOIS

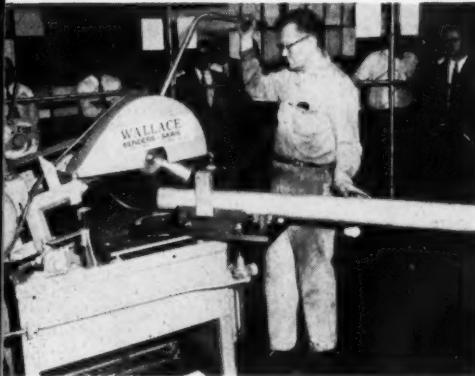
new shop equipment . . .

END JOINT PREPARATION SYSTEM

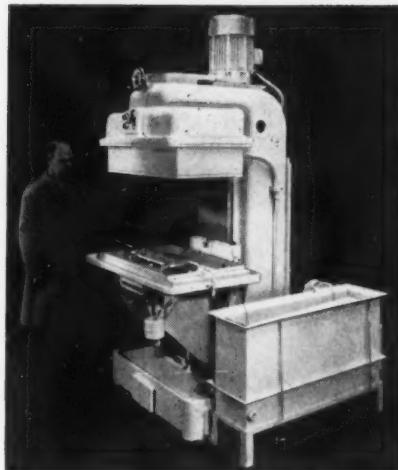
Wallace Supplies Mfg. Co., 1804 West Cornelia Ave., Chicago 13, Ill., announces a method or system to prepare pipe or tube ends for welded structures. This is known as the De Witt System of Joint Preparation. All that is necessary is to use the specially designed fixture, mounted on a standard Wallace Cut-Off Unit and cut according to a chart, giving degree settings. A smooth end, which is ready for welding at the angle desired, is the result.

The De Witt System provides the following: pipe or tube ends prepared for welding to other pipe or tubes; any angle from a tee (90) to 35 degrees; no dies needed; cuts any alloy of steel (abrasively); cuts any alloy of aluminum (metal wheel); joint has a built-in welding groove; joints for small to large pipe; joints on or of centerline of intersection; fast—5 inch pipe for a 45 degree connection to another 5 inch pipe, only three minutes; no filing or grinding for fit-up.

For more data circle 86 on Postpaid Card



Wallace Cut-Off Unit is shown here being used to prepare a pipe end for welding



Sundstrand Multiple Spindle Precision Drilling, Boring, Reaming and Tapping Machine

MULTIPLE SPINDLE DRILLING AND BORING MACHINE

A precision multiple spindle drilling, boring, reaming and tapping machine, equipped with quick-change heads that require no gearing to drive the work spindles, thus, requiring minimum center distances between spindles, is announced by Sundstrand Machine Tool Division, Sundstrand Corp., Belvidere, Ill. The machine is designed for non-ferrous metal parts.

Two sizes are available, offering either an 18 by 36 or 9 by 14 inch head. Both sizes of machines can have heads changed completely in 15 to 20 minutes. Similar parts with a few different holes can be accommodated by providing additional spindles, which can be quickly fitted with a tool.

A feature is a machine spindle drive that eliminates the need for gearing of any type in the heads. This permits relatively low cost head assemblies to be developed using low cost spindles and parts to minimize original equipment outlays.

For more data circle 87 on Postpaid Card

new shop equipment . . .

HIGH PRODUCTION HONING FOR SMALL DIAMETER PARTS

A newly designed version of the Model 10 Honing Machine is introduced by the Barnes Drill Co., 860 Chestnut St., Rockford, Ill., for manual or automatic honing of bores from $\frac{1}{4}$ to $1\frac{1}{2}$ inches in diameter. The control panel has been raised to a more readable position, the front of the cabinet is fully enclosed and the head has received a modernistic styling treatment. These changes give the Model 10 a compact, unified appearance that emphasizes the machine's simplicity of design.

The illustrated model has tooling designed to hone bearing rod ends and inner races with i.d. from 0.4995 to 1.005 inch and stock removal from 0.006 to 0.008 inch. At 80 percent efficiency, production is 131 pieces per hour. Automatic sizing by the Plug-

matic bore-to-bore sizing unit according to the manufacturer, maintains size consistency within 0.0002 inch from bore to bore.

For more data circle 88 on Postpaid Card

★ modern machine shop ★

LARGE, FAST SPACING TABLE IS CONTROLLED BY TAPE SYSTEM

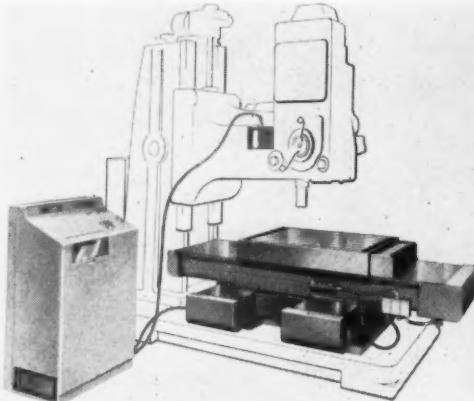
A positioning table, developed by Cincinnati Bickford Division, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is operated by a numerical control, developed specifically for the application. It will accommodate work weighing up to 10,000 pounds.

The numerical positioning system, operated by either punched tape (choice of several sizes) or a manual keyboard, is designed to position up to 5 tons of work for drilling, reaming, boring, tapping or layout at speeds of 360 i.p.m. at accuracies to within 0.001 inch, and with repetitive accuracy to within 0.0005 inch.

The table itself is both large and rugged. It measures 38 by 50 inches overall, has a travel of 32 by 44 inches and an overall height of $26\frac{1}{2}$ inches. For more data circle 89 on Postpaid Card



The Barnesdril Model 10 Honing Machine



Two Axis, Tape Controlled Positioning Table

The head that offers
**EXTRA
 TAPPING
 HOURS!**

**built-in features assure continuous
 operation for longer periods!**

On job after job—in shop after shop—the reaction is the same: "Procunier heads are producing and lasting far beyond expectations." And no wonder! They're more than just tappers, they're precision instruments, carefully machined, accurately ground, balanced, pre-tested. Rugged, sensitive, they combine advanced features and advantages that mean just one thing—more production for less. Procunier heads give you sustained operation at faster speeds; unparalleled accuracy, fewer broken taps; less spoiled pieces; perfection in produced parts, and less operator fatigue. Here's why you get EXTRA TAPPING HOURS: heads mount rigidly eliminating chatter and vibrations; sensitive friction clutch automatically regulates driving pressure; ball bearings assure smoother, longer lasting "driving"; heat treated gears with special gear reversing mechanism; unique tap holding spindle support **PLUS** other important features.

Write for FREE Brochure

giving complete details and specifications on the complete line of Procunier Tapping Heads.

**PROCUNIER
 SAFETY CHUCK COMPANY**

12. S. CLINTON ST., DEPT. 9
 CHICAGO 6, ILL.

For more data circle 440 on Postpaid Card

September, 1959



**Exclusive
 "TRU-GRIP"
 Tap Holder**

is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

PROCUNIER SAFETY CHUCK CO.

12 S. Clinton St., Chicago 6, Ill., Dept. 9

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name. _____

Address. _____

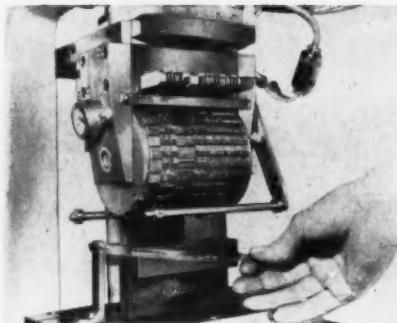
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new shop equipment . . .

**COMBINATION NAME,
NUMBERING AND
LETTERING HEAD**

A 25 to 35 wheel numbering head, that also does trade mark and name stamping in any desired combination, has been developed as a standard by The Acromark Co., 9 Morrell St., Elizabeth, N. J. More or less wheels are provided by substituting engraved wheels for blanks and vice versa.

This Hot Stamping Head No. 441 is provided with thermostatic heat control, to provide proper stamping temperatures, and a thermometer. The ample size, cartridge type, heating element is mounted in the center shaft or axle, which is oversize to provide



The Acromark Hot Stamping Head No. 441

stamping strength under heat stress.

Overall size is approximately 6 inches wide by 8 inches high, including shank, by 6 inches deep.

For more data circle 90 on Postpaid Card

New **40-TON DOUBLE CRANK O.B.I.**
Rousselle



**WITH NEW ELECTRICALLY
CONTROLLED AIR CLUTCH**

- "Plug-in" foot and hand controls.
- Single stroke, continuous and jog selector.
- Low air consumption.
- Large die area.
- Roller bearing flywheel.
- Bronze main and crank bearings.

CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES



SERVICE MACHINE CO.

Mfrs. of Rousselle Presses
2310 WEST 78th STREET • CHICAGO 20, ILL.

ROUSSELLE PRESSES ARE SOLD EXCLUSIVELY THROUGH LEADING MACHINERY DEALERS
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"there's something new in bearings, too!"

...ask your Bunting distributor

about startling new Bunting products in newly developed, low-cost bearing metals. Today he carries in stock for your money-saving convenience:

• **751** sizes of Sintered Oil-filled Bunting Bronze plain, flange and thrust bearings and 6½" tubular and solid bars. Only Bunting supplies sintered oil-filled stock bearings made to ASTM standards, assuring dependable uniformity and quality in every detail.

• **138** sizes of Bunting Bearing Aluminum 13" tubular and solid bars. Bunting Bearing Aluminum is the outstanding new low cost, light weight bearing metal that squarely meets many of today's urgent needs in machinery production and maintenance.

ASK OR WRITE FOR THESE CATALOGS:

CATALOG NO. 58—Listing 866 stock sizes of Bunting Cast Bronze Bearings and 13" tubular and solid Precision Cast Bronze Bars and 751 stock sizes of Bunting Bronze Sintered Oil-filled Bearings and Bars.

CATALOG NO. 238—Listing 343 Bunting Cast Bronze Electric Motor Bearings for all makes and sizes of electric motors from 1/50 to 100 HP.

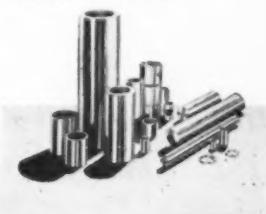
BAR CARD 40—Listing 138 sizes of Bunting Bearing Aluminum Tubular and Solid Bars and giving comprehensive technical data.

ENGINEERS—MANUFACTURERS
Write for "**ENGINEERING HANDBOOK ON POWDER METALLURGY**"—an authentic technical 48 page book by Bunting Engineers.

Bunting

BEARINGS, BUSHINGS AND SPECIAL PARTS OF
CAST BRONZE OR SINTERED METALS.
ALCOA[®] ALUMINUM BARS.

The Bunting Brass and Bronze Company, Toledo 1, Ohio
Branches in Principal Cities. Evergreen 2-3451

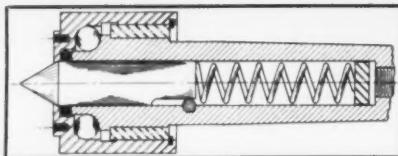


For more data circle 442 on Postpaid Card

new shop equipment ...

SLIDING CENTERS

Rigid Products Co., P.O. Box 162, Cincinnati 15, Ohio, announces its new "Spacenters," designed to give accurate axial location of workpieces for precision grinding. This headstock center consists basically of a carbide tipped dead center that retracts against adjustable spring tension until



Shown above is the Rigid "Spacenter"

the end of the workpiece locates against a revolving stop. This brings successive workpieces into the same axial position with respect to the end of the workpiece without respect to variations in the depth of the centers.

These centers are also arranged for assembly with a hollow stop to permit location from a shoulder on the workpiece, rather than from the end. This is an advantage when a close tolerance must be held between two shoulders.

The sliding centers are precision ground and lapped to operate without radial play. The revolving stop is designed with integral races in order to provide for maximum high precision and capacity with corresponding minimum amount of bulk.

For more data circle 91 on Postpaid Card



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

On Brown and Sharpe, AND OTHER AUTOMATICS

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For approximately \$50 you get a dozen sets of $\frac{3}{4}$ -16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "UNIFIED AND AMERICAN SCREW THREAD DIGEST"

THE EASTERN MACHINE SCREW CORP.

40-50 Barclay St., New Haven, Conn.

For more data circle 443 on Postpaid Card



NEW IDEA

IMPROVES
COLD-FORMING TAPPING

JARVIS PRESENTS NEW **JAR-FLO** TAPS FOR
CHIPLESS FORMING (INSTEAD OF CUTTING)
OF THREADS IN THRU OR BLIND HOLES



*EXCLUSIVELY

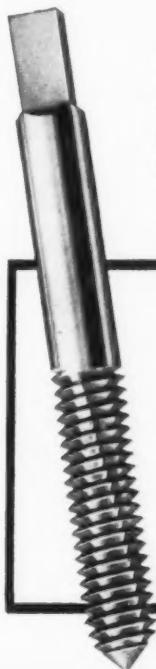
JAR-FLO

Unique design with lobes, or pressure contact points, gives true geometrical contact. Lobes are generated on Helical Ground Threads to give progressive working of metal and smooth burnished finish.

JAR-FLO

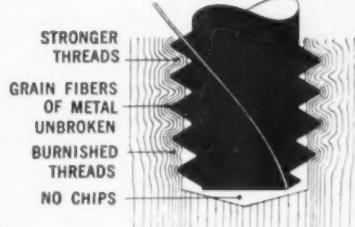
ADVANTAGES

1. NO CHIPS
2. FASTER TAPPING CYCLES
3. HIGHER TAPPING SPEEDS
4. LESS DANGER OF BREAKAGE IN TAPPING BLIND HOLES CAUSED BY CHIP INTERFERENCE.
5. LONGER TAP LIFE REDUCES COSTS
6. ELIMINATES SHAVED AND OVERRIDED THREADS



JAR-FLO TAPS FOR

ALUMINUM	ZINC—LEAD
MAGNESIUM	LEADED STEELS
COPPER—BRASS	DIE CASTINGS
& OTHER DUCTILE METALS	



HELICAL FORMING THREADS
(FORMS THREADS WITHOUT CUTTING)



JARVIS CORPORATION

Middletown, Connecticut



SEND COUPON TODAY FOR PROMPT DETAILS

JARVIS CORPORATION
101 Pease Ave., Middletown, Connecticut

Have Rep. call Send brochure, prices

Name Title

Company

Street

City State

For more data circle 444 on Postpaid Card

"ENGINEERED" PRODUCTION MARKING EQUIPMENT

PERIPHERAL MARKING MACHINE Model 9AH

Marks precision calibrations and graduations around dials. Uses flat dies to mark round and roll dies to mark flats. A high production machine that will not break even brittle plastic parts. Write for Catalog. No. 9AH.

PRECISION MACHINES
and ALL EQUIPMENT including
DIES, FIXTURES, CONTROLS, etc.

ACROMARK MARKING MACHINES are of more than 300 different kinds — each one developed for its specific field. STOCK models are the ones most widely used and adapted — but you'll get the correct machine for the job if you buy ACROMARK.

Write today for 1959 General Catalog, fully indexed, covering over 500 marking machines and tools, all originated and patented, copyrighted or registered at U. S. Pat. Off. by ACROMARK. Send sketch or details of your marking need for Engineer's recommendation — without obligation.

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PAT. OFF.

The
ACROMARK
Company

■ Morrell St., Elizabeth 4, N. J.

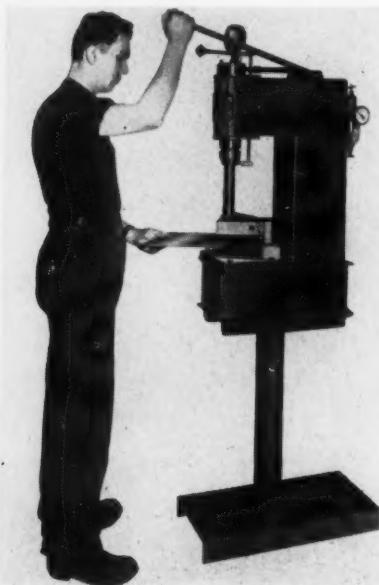
"The Original Marking Specialists"

For more data circle 445 on Postpaid Card

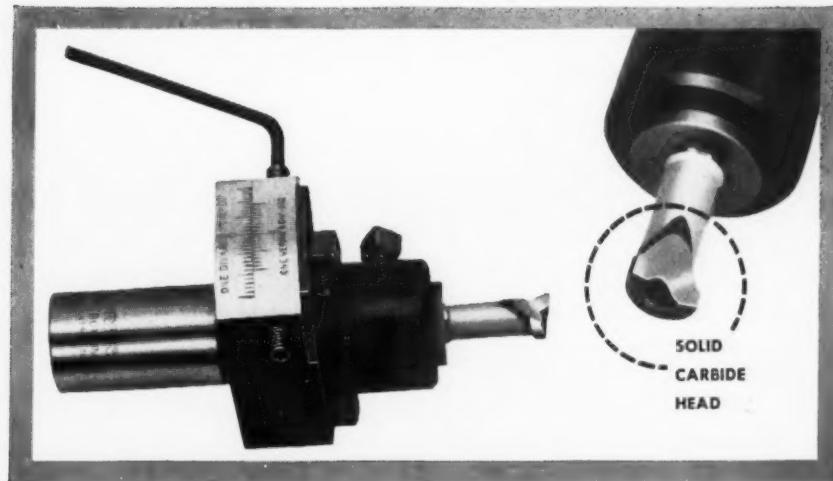
new shop equipment . . .

10 TON ARBOR PRESS EMPHASIZES SPEED AND VERSATILITY

Featuring an air actuated, fast ram approach, a 10 ton hand operated hydraulic bench arbor press is equipped for utmost speed and ease of operation, according to K. R. Wilson, Inc., Arcade, N. Y. Adaptable to a wide range of bending, straightening, forming and punching applications, it can be operated at more than 20 s.p.m. When the hand operating lever is raised, the ram comes down to meet the work in a fraction of a second. When the hand lever is lowered, hydraulic pressure is applied to the work. Once the job is done, the ram is quickly spring-returned to top position by simply flipping the pressure release knob above the pumping unit. For more data circle 92 on Postpaid Card



KRW 10 Ton Hydraulic Bench Arbor Press



BOKUM Your Best Buy in Boring Tools

Illustrated here is one of the tool industry's most versatile combinations—the Bokum Swing Tool Holder and the Bokum Short-Neck Boring Tool with solid carbide head.

The Bokum Swing Tool Holder provides precision, offset boring on turret lathes, screw machines and multiple spindle automatics. These modern tool holders eliminate many secondary reaming operations . . . provide maximum rigidity . . . reduce set-up time

because they are vernier adjustable within .001" and are available with holder shanks ranging in size from $\frac{5}{8}$ " through $1\frac{3}{4}$ ".

Bokum Short-Neck, Carbide Head Boring Tools offer maximum accuracy because their short, stubby neck increases rigidity . . . are guaranteed to maintain correct clearance angles throughout tip life . . . require sharpening on one face only and are available in as many as five neck lengths per size range.

Write today to Dept. B for catalog HSS-500; CT500 and 483-1.



TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO. INC.

14775 Wildemere Ave., Detroit 38, Michigan

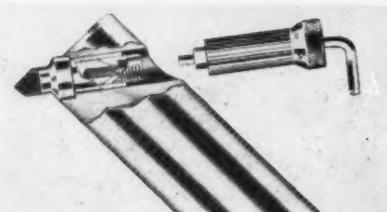
For more data circle 446 on Postpaid Card

new shop equipment . . .

LINE OF MICROMETRICALLY ADJUSTABLE BORING TOOLS

Scully-Jones and Co., 1909 South Rockwell St., Chicago 8, Illinois, announces the "Sure-Bore" line of micrometrically adjustable boring tools.

The "Sure-Bore" line includes: (1) micrometrically adjustable boring cartridges (with presharpened carbide tipped tool bits) in two types, 53 and



"Sure-Bore" Adjustable Boring Cartridge

90 degrees, for plants that manufacture their own boring bars. (2) double-point units—for production boring and reaming feature "Sure-Bore" cartridges, diametrically opposed to eliminate spring and insure regularity in hole size. Bore sizes range from $1\frac{7}{8}$ to $7\frac{5}{8}$ inches. (3) single-point boring heads—with threaded shanks that simplify mounting on bars of various lengths and diameters. (4) single-point boring bars—with compact 53 or 90 degree tool bits, which maintain maximum bar strength for jobs that require extreme accuracy.

Each unit of the Scully-Jones "Sure-Bore" line is furnished with one long and one short tool bit; range is 1 to $3\frac{5}{8}$ inches.

For more data circle 93 on Postpaid Card

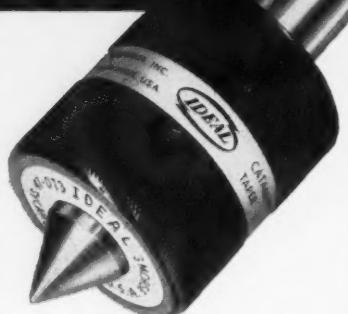
New **IDEAL**
**GOLD
BAND**
LIVE CENTERS
GUARANTEED TO MATCH ACCURACY
AND CAPACITY OF YOUR LATHES

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to $\pm .0001$) GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lather output both in quantity and quality. Contact your distributor today!



IDEAL INDUSTRIES, Inc.
1031-1 Park Ave.
Sycamore, Illinois

For more data circle 447 on Postpaid Card



A COMPLETE LINE FOR EVERY
NEED—SPECIALS TOO!



Write for
Complete catalog data
and specifications.

September, 1959

Saves 85% gaging time!

"We estimate the DR-25 saves 85% of our time in checking hundreds of cylindrical plug gages every week. We save all the time formerly consumed in gage block build-ups to check each go and no-go gage. The generous spindle travel of the DR-25 accommodates a great range of work without accessories. We can now check thread plug and thread setting plug gages in a third of the time formerly required to check them with gage blocks and comparators."

*Charles McArthur, Gage
Engineer, Aeroquip Cor-
poration, Jackson, Mich.*

BAUSCH & LOMB DR-25 OPTICAL GAGE

- Direct scale reading to .0001"
- 0" to 3" range without gage blocks.



BAUSCH & LOMB



Distributed in the U.S.A. through the DoALL Co.

For more data circle 448 on Postpaid Card

September, 1959

WRITE for Catalog D-285. Demonstration
on request. Bausch & Lomb Optical Co.,
89345 St. Paul Street, Rochester 2, N. Y.

new shop equipment . . .

SPECIAL FLUE HOLE PUNCH

A special flue hole punch is announced by The Cleveland Punch & Shear Works Co., East 40th and St. Clair Ave., Cleveland 14, Ohio.

This special punch and die set is ruggedly built to punch oblong holes $3\frac{1}{2}$ by 4 inches long through $\frac{1}{8}$ inch boiler plate, permitting fast assembly of water-circulating pipes in movable



Heavy Duty Flue Hole Punch (left), capable of punching a $3\frac{1}{2}$ inch by 4 inch oblong hole through $\frac{1}{8}$ inch thick steel plate, together with its accompanying die (right).



FREE!

Get your free copy of "How to make your own machine and repair parts quicker and easier" . . . 24 pages. It tells the story of STRESSPROOF®, the all-purpose steel bar that doesn't have to be heat treated, yet is strong, machines faster, and wears better.

One stock of STRESSPROOF will take care of most of your needs. STRESSPROOF is available from your Steel Service Center.

La Salle STEEL COMPANY
1474 150th STREET • HAMMOND, INDIANA

For more data circle 449 on Postpaid Card

water-cooled grates. In addition to the saving in production time, the design of the custom built punch results in greater accuracy in fabrication and assembly. A noteworthy feature of this heavy duty flue hole punch is the floating spring-center locating pin that recedes into the punch, once it is accurately centered on the boiler plate workpiece.

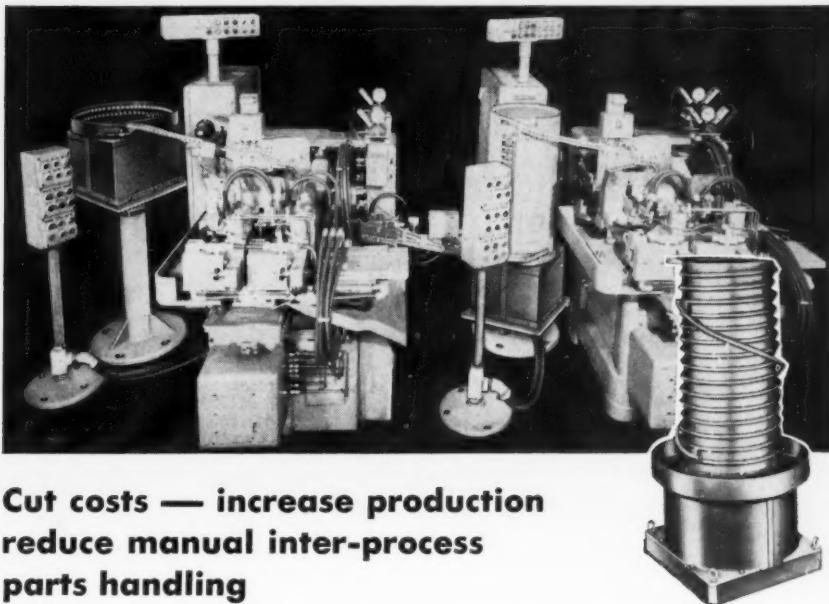
Oblong in shape, this special Cleveland flue hole punch has a $\frac{3}{8}$ inch shear, 5 inch head, $4\frac{11}{16}$ inch shank and is $3\frac{1}{8}$ inches long. Its accompanying die has an outer diameter of 6 inches and is $1\frac{7}{8}$ inches high.

For more data circle 94 on Postpaid Card

SYNTRON

Transfer & Storage

PARTS FEEDERS



**Cut costs — increase production
reduce manual inter-process
parts handling**

SYNTRON Transfer & Storage Parts Feeders provide an automatic link between process operations. They automatically receive, store, orient and discharge parts at a controlled rate from one operation to another. Parts may be received at one level and discharged at another—conveyed either up or down spiral as desired. Rate of parts flow is instantly controllable to operational demands.

Simplicity of design, working on an electromagnetic principle eliminating mechanical wearing parts means dependability and low maintenance.

Reduce costs—increase production, eliminate tote box storage and manual parts handling, save floor space with SYNTRON Transfer & Storage Parts Feeders.

Write for descriptive literature today

SYNTRON COMPANY

309 Lexington Avenue

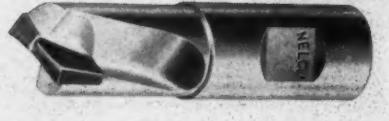
Homer City, Penna.

For more data circle 450 on Postpaid Card

new shop equipment . . .

TWO FLUTE END MILL

Now available from Cutting Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I., is a Nelco Series 600 Center Cutting, Two Flute, Carbide Tipped End Mill, which is recommended for all materials. It is a true helix end mill, designed to plunge cut and peripheral mill. The "radial hook"



Nelco Two Flute Carbide Tipped End Mill

gives free shearing action in plunge cuts. The short length gives increased

rigidity and makes for superior performance on rugged cutting operations. Greater chip clearance and added flute strength are additional features.

This end mill is available in sizes $\frac{3}{8}$, $7/16$, $1/2$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 inch.

For more data circle 95 on Postpaid Card

★ ★ ★

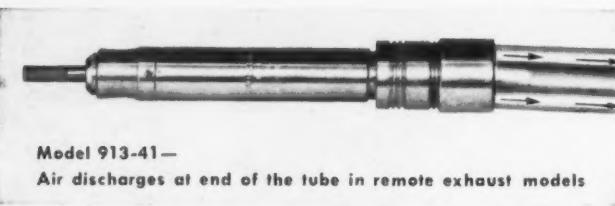
OSCILLATING BELT GRINDER

Deburring, descaling, grinding and polishing can all be accomplished on the Tri-Matic Oscillating Belt Grinder, introduced by Sales Service Mfg. Co., 2361 University Ave., St. Paul 14A, Minnesota.

The controlled oscillating movement of the abrasive belt through

NEW WILSON

Pneumatic Die Grinders
for better, faster filing,
grinding, cutting and polishing jobs



Model 913-41—

Air discharges at end of the tube in remote exhaust models

These small, powerful tools are valuable time savers on a wide range of work in tool and die shops, machine shops, pattern shops and foundries for a variety of filing, grinding, cutting and polishing work. Available in 40,000 and 60,000 rpm models. Write for Catalog PT-58.

**Wilson also makes
a wide range line of
PNEUMATIC
Horizontal Grinders**

TW-894A

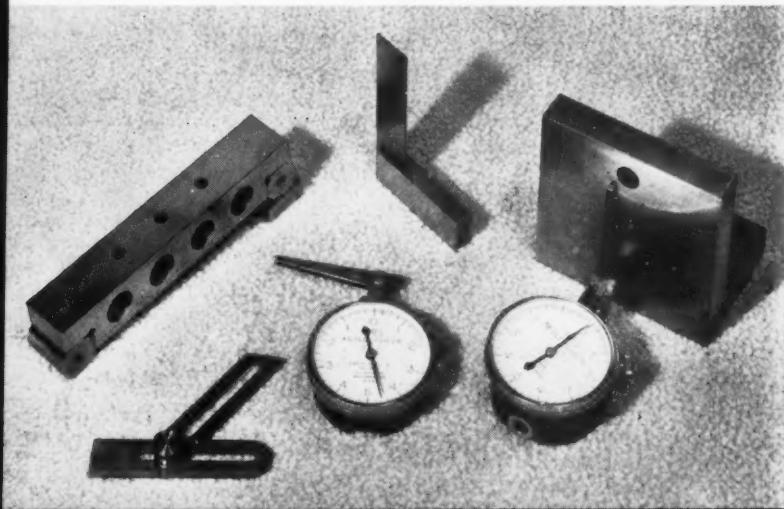


THOMAS C. WILSON, INC.

21-11 44TH AVENUE, LONG ISLAND CITY 1, N. Y.

For more data circle 451 on Postpaid Card

Check Angles Quickly and Precisely with the New



AMES DIAL TYPE ANGLE CHECK®

ANGLE CHECK, a new dial type measuring instrument, offers you a fast, low cost, extremely accurate method for checking angular parts.

There are two ANGLE CHECKS: Model V for vertical work; Model H for horizontal. Either model takes AMES 200 Series backs. Contact blades are available in various shapes and lengths.

Ruggedly built, ANGLE CHECK saves hours in checking angles on simple and intricate shapes.

The contact blade can be set to a predetermined angle with the dial "0" under the indicator hand. A range of 5°—plus or minus—in increments of 5' can be obtained. ANGLE CHECK is accurate to 5'. Write today for complete information.

Representatives in Principal Cities



B.C. AMES CO.

29 Ames Street, Waltham 54, Mass.

Canadian Office — B. C. Ames Co., 45 Oriole Parkway, Toronto

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES
For more data circle 452 on Postpaid Card

AFTER YOU CUT THEM...



How do you use them?

How you use material *after* you cut interests Wallace as much as does the alloy, or size or the shape you cut. If, after the cut, you need smooth cut ends, free of burn, and nearly burr-free, then Wallace Cut-Machining is definitely *your* type of cutting.

For Wallace Abrasive Cut-Machining Units give your material two smooth "machined-like" ends with the first cut. Often no further end-machining is needed. Here is economy with every cut of solid bars, structurals, small and "big-inch" pipe and tubing, any alloy. The right Cut-Machining Unit for your special requirements can be quickly determined at no cost or obligation to you.

So? Let's discuss your cutting problem. Write, or

Call Wallace Collect *Lee*
Chicago number: **BUCKINGHAM 1-7000**

Ask for CUTTING CLINIC
and reverse charges, please!

THIS BOOKLET
shows you how Cut-Machining
solves other cutting problems.
Be sure to ask for it. It's free.



Write, if you prefer, to

WALLACE SUPPLIES MFG. CO.

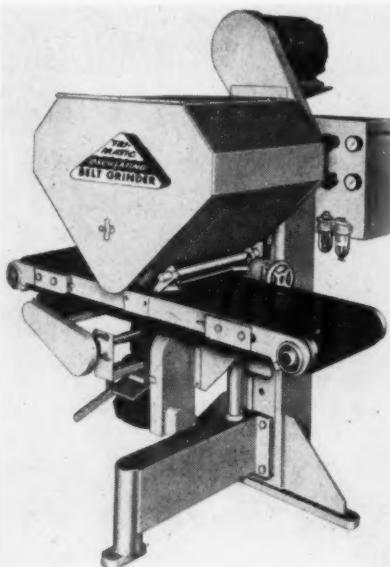
1804 W. Cornelio Ave. • Chicago 13, Illinois
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212 modern machine shop

new shop equipment . . .

positive steering without stretching is said to have the following advantages: faster cutting, less loading and longer belt life through the shearing action of the abrasive belt. The problem of belt tracking is completely eliminated on any belt width from 6 to 12 inches and belt changing is a simple matter of slipping one belt off and another on.

Belt oscillation is maintained and controlled by air-jet sensing. This activates electronic controls and imparts a continuous oscillating belt action with variable and adjustable lateral travel and lateral travel speed. A significant factor of the air-jet sensing principle is the low inertial character of the steering. Oscillation is accomplished without changing the length of the belt path and without undue tension on the belt. Further operational versatility is possible with



The Tri-Matic Oscillating Belt Grinder

September, 1959

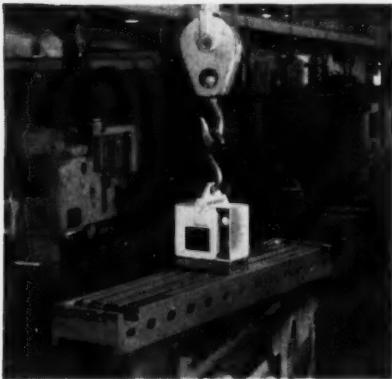
Make work handling safer, faster, easier with self-contained lift magnets

SIMPLE OPERATION permits any worker to handle heavy, irregularly shaped workpieces without danger or damage when conventional work-handling equipment is converted to magnetic lifting with Sundstrand "Power-Grip" lift magnets.

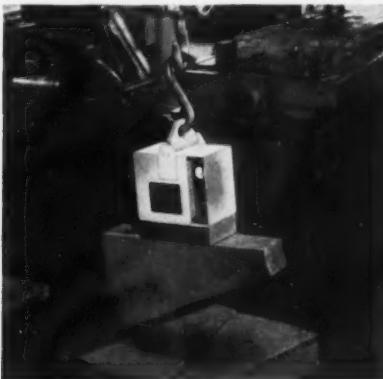
QUICK CONVERSION of job or overhead cranes from conventional to magnetic lifting because unit is self contained battery operated and does not require external power connections. Remote controls can be provided if desired.

TWO CAPACITIES available offer 2,000 and 4,000 lb. of lift. Power is supplied by conventional automotive type 6 and 12 volt batteries.

SELF-CONTAINED POWER makes lifting power available in plant or out. Receptacle provided for trickle charger that brings battery up to full charge during idle hours. Dial shows charge condition.



Positioning machine table in assembly.



Lifting heavy pie-shaped segments.

DISTRIBUTORS: Sundstrand Lift Magnets offer attractive sales opportunities. Investigate. Details on request.



SUNDSTRAND-AMERICAN BROACH

DIVISION OF SUNDSTRAND CORPORATION

ANN ARBOR, MICHIGAN

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new shop equipment . . .

the Tri-Matic by the adjustability of the conveyor table height. This will allow a work-belt clearance from 0 to 5 inches from the conveyor belt to the abrasive work-belt.

For more data circle 96 on Postpaid Card

★ modern machine shop ★

DEVELOPMENTS BROADEN UTILITY OF FABRICATORS

Wales-Strippit, Inc., 207 Buell Rd., Akron, N. Y., has developed a Microbar gaging assembly and a toggle switch control mechanism which increase the convenience and efficiency of high speed, quick change punch presses.

The Strippit Microbar Assembly,



View shows fast adjustment of Microbars for punching from layout or drawing specifications. Lateral adjustment has been made and stop is being placed to nearest inch in bushed hole of vertical bar. Dial indicators provide reading to nearest thousandth inch.

mounted on the pantographic duplicator attachment of a fabricator,

com pare



- SPEED
- ACCURACY • QUALITY
- PRICE

You will know the best buy is . . .

BACKUS ABRASIVE WHEEL CUT-OFF MACHINES

For Ferrous Metals

Precision-built Backus Abrasive Wheel Cut-Off Machines have won acceptance in scores of plants and shops throughout the country. Bars, shapes and tubing of steel and alloys are cut quickly and accurately at any angle. Operates with 12 inch abrasive wheel.

Write Today For More
Information And Price!

BACKUS MACHINE WORKS

ROUTE 17, CARLSTADT, N. J.

SINCE 1914

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*May Be Used For
Non-Ferrous Metals
With Simple Con-
version Unit!*

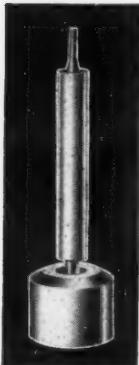
For fast, economical cutting of flat metal shapes there are
7 MODELS OF Campbell Nibbling Machines

...with cutting capacities ranging from 3/32" mild steel for **MODEL 0** machine to 1/2" mild steel for **MODEL 530**, in sheet sizes from 16" or less, to 72".

CAMPBELL NIBBLERS are making tremendous savings in time and money for hundreds of users in aircraft and other metal-working plants.

...in fast cutting of ferrous and non-ferrous sheet metals or composition sheets.

...for moderate production runs or experimental development work.



Economical
"throw-away"
punch and die



Send for this
catalog for com-
plete information
on this versatile
production and
experimental tool

• CAMPBELL NIBBLERS cut from 40 to 60 times faster than drilling or filing. A fast-moving punch (350 to 900 strokes per minute) operating over a die, nibbles out the design, taking a small "bite" with each stroke of the punch.

- for any and all kinds of shapes
- for either inside or outside cuts
- with no distortion of material—no internal strains
—no invisible fractures—no burr
- with a "nibbled" edge that is sufficiently smooth
to require very little finishing and sometimes none

CAMPBELL standard punches are made double end to double work life and halve the cost. Prices are so low (starting at 40c each, or 20c per working end) that new punches cost less than regrinding dull ones.

Here is a quick picture of CAMPBELL NIBBLING MACHINE Capacities

Campbell Nibbler Model #	Sheet Width	WORKING CAPACITY		Strokes per Minute
		Sheet Thickness Mild Steel	Sheet Thickness Alloy Steel	
0.....	16"	3/32"	1/16"	900
1A.....	20"	3/16"	1/8"	375-650
430.....	60"	3/8"	1/4"	350-525
436.....	72"	3/8"	1/4"	350-525
530.....	60"	1/2"	5/16"	350-525
2524.....	48"	1/4"	3/16"	375-650
2536.....	72"	1/4"	3/16"	375-650

CAMPBELL NIBBLERS
Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

Dept. 931, 230 Park Avenue, New York 17, N. Y.

For more data circle 456 on Postpaid Card

September, 1959

modern machine shop 215



new shop equipment . . .

makes it possible to produce templates or single production pieces to extremely close tolerances. The assembly consists of one machined bar, bridging the duplicator carriage, and another mounted on the work table. Both bars are precision drilled and bushed at 1 inch intervals, with dial indicators to provide forward, backward and lateral

settings to the nearest thousandth inch. Stops placed in the bushed holes in both Microbars contact each dial indicator arm to provide the readings. Operation involves merely placing the stops to the nearest inch as specified on the layout or drawing, then adjusting the carriage to obtain the desired reading in thousandths, and locking the carriage in position. This automatically positions the work on the fabricator table and the machine is tripped to punch the hole.

The toggle switch mechanism cuts changeover time between template punching and production punching with the Strippit Fabricator-Duplicator. Punching sheet metal master templates on this machine is done by foot treadle, using either the Strippit Microbars or the Dupl-O-Scope optical locator to position the template blank. Production punching, however, is done automatically by a self-tripping duplicator stylus as it is inserted into each template pilot hole. The toggle switch permits instant changeover without changing power plugs.

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- ＊ Removing chips, shavings, filings, and airborne debris that clog machinery, distort tolerances, mar product finishes.
- ＊ Controlling mists and fogs in wet machining operations.
- ＊ Recovering valuable dusts, coolants, heated air.
- ＊ Protecting machinery investments with preventive maintenance.

FREE...latest specs and data on TORIT Dust Collectors for handling these and other air pollution problems.
TORIT: the high efficiency line with savings up to 1/2!

- ＊ Reducing absenteeism with improved health and safety precautions.

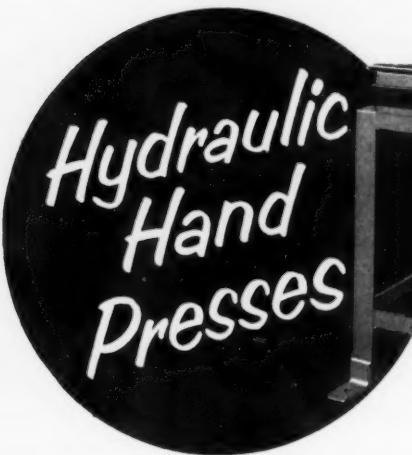
WRITE TODAY:

TORIT MANUFACTURING CO.
1133 Rankin Street, St. Paul 16, Minn. Dept. 714

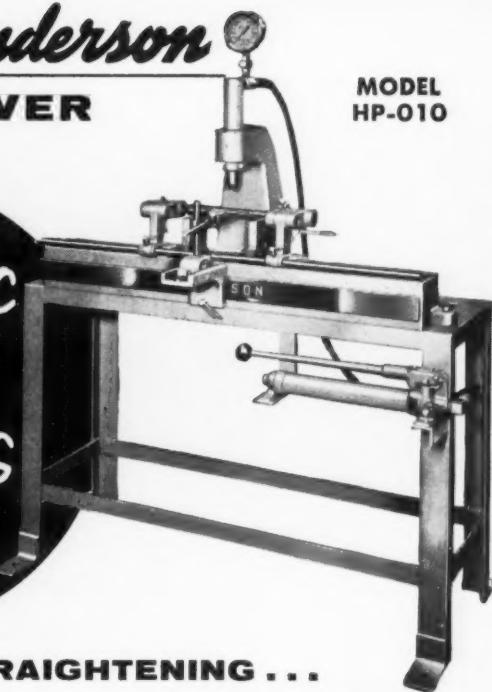
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ANOTHER *Anderson*
TIME-SAVER

MODEL
HP-010



Hydraulic
Hand
Dresses



**ACCURATE STRAIGHTENING . . .
AT LOW COST**

The Anderson Hydraulic Hand Press was developed to *reduce costs*. Checking and straightening are accomplished in one position . . . eliminating the time consumed shifting parts back and forth from checking fixtures to straightening anvils. Efficient hand hydraulic pumps power various models of presses ranging in capacity from 10 to 50 tons. Attachments make possible the checking of stepped or odd shaped parts with centers. Different lengths of work can be handled by easy adjustment of rolls and centers. A pressure gauge is standard equipment. A special attachment is an indicator calibrated to thousands of an inch for locating high and low spots on the work, and to indicate how much the shaft is bent under pressure. An Anderson Hydraulic Hand Press can help you solve your straightening problems.



Write for Bulletin No. 9-22

ANDERSON BROS. MFG. CO.
ROCKFORD, ILLINOIS

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new shop equipment . . .

NEW LINE OF GRINDERS

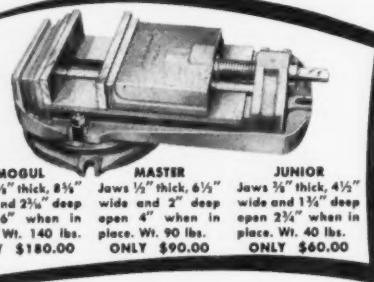
Details of the 904 Series in its line of portable pneumatic grinders are announced by Thomas C. Wilson, Inc., 21-11 Forty-Fourth Ave., Long Island City 1, N. Y. This series includes 6 inch horizontal grinders, wire brushing machines and horizontal buffers. A choice of three speeds is available.



This wire brushing machine is part of the 904 Series in the line of pneumatic grinders, developed by Thomas C. Wilson, Incorporated

LW MILLING MACHINE DRILL PRESS CHASER VISES

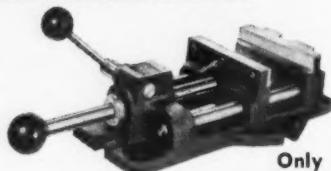
- Super-Strong
- Flange Construction
- All surfaces ground for extreme accuracy
- Full length bearing on ground bar and machine ways
- Steel jaws
- Work holding surfaces are always at true right angles, or parallel to the table
- Large Acme steel screw with replaceable bronze nut.



L-W ADJUSTO-QUICK CONTROL DRILL PRESS VISE AND FIXTURE HOLDER

The first wide range drill press vise that safely handles both rigid and non-rigid work without distortion. Quick action and adjustable pressure at the turn of a knob. Easy hand pressure on hardened and micro-ground bar locks and holds the work.

Precision-built to cut tooling costs and increase production. Heavy removable jaw inserts allow simple, quick adaption for low-cost jigs and fixtures.



Only

\$31.50

\$44.00

\$57.00

Available with or without swivel base.

SEE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR OR
ORDER DIRECT, GIVING DISTRIBUTOR'S NAME



CHUCK COMPANY

28 So. St. Clair St.
Toledo 4, Ohio

MAGNETIC
CHUCKS

DIVIDING
HEADS



For more data circle 459 on Postpaid Card
218 modern machine shop

able in the grinders and wire brushing machines, 9, 7.2 or 6 thousand r.p.m. (free speeds). The choice of speeds for the horizontal buffers is either 9 or 6 thousand r.p.m. Either lever, straight or grip type handles may be specified.

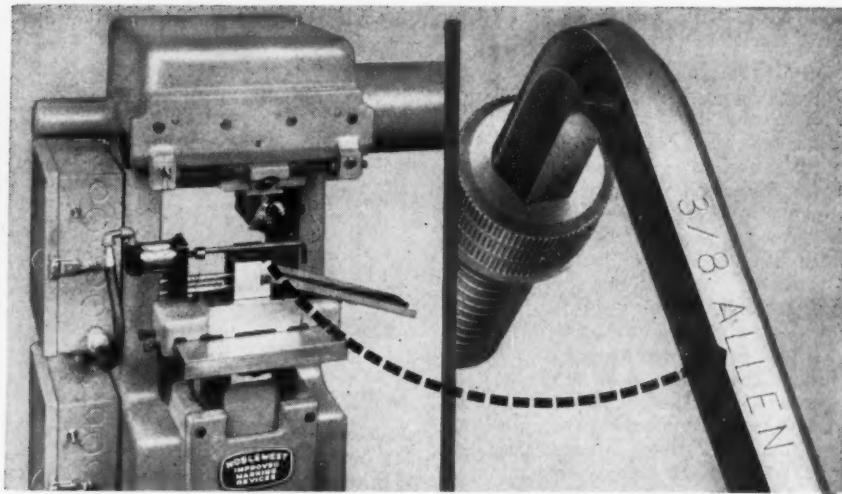
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★ ★ ★

POWER SLITTER

A power slitting shear introduced by Beverly Shear Mfg. Co., 3000 West 11th St., Chicago 43, Ill., features a deep throat and a rugged and easily adjusted back gage.

Made in three sizes (capacities: 10, 14 and 20 gauge in mild steel), the shear has two reversible, interchangeable



Roll Marks permanently indented manufacturer's inscription.

HIGH PRODUCTION MARKING WITH NEW *Cyclomatic* CONTROL

This general purpose marking machine combines the original NOBLEWEST Roll Marking process with CYCLOMATIC CONTROL . . . an exclusive NOBLEWEST electro-pneumatic circuit for completely automatic cycling. When set for automatic operation the machine cycles continuously with no further attention required from the operator. A dual control system also provides for semi-automatic operation or for short production runs. This model can also be equipped with an air ejection system (see above) plus an automatic hopper or dial feed. The basic Model 50PI features a low price, plus quick delivery! For additional details on how NOBLEWEST Marking Machines, tools and dies can lower your production costs, write for new catalog. The Noble & Westbrook Manufacturing Company, 25 Westbrook Street, East Hartford 8, Conn.



A few desirable territories open to qualified representatives

MARK IT BEST WITH

NOBLEWEST



MARKING

NUMBERING

EMBOSSING

GRADUATING

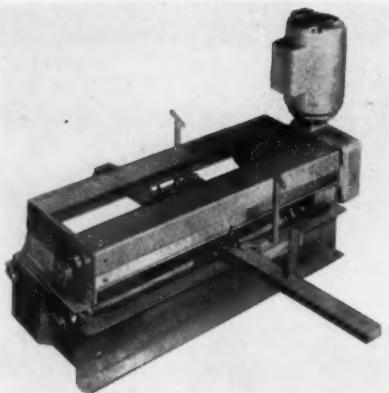
For more data circle 460 on Postpaid Card

new shop equipment . . .

able, high carbon, high chrome cutters which are driven through steel shafts by a heavy duty gear set, which is connected to a completely enclosed worm gear drive. An electric motor is directly connected to the worm gear housing to provide positive operation.

The back gage is clamped to both sides of the heavy machine frame to provide maximum support and strength to withstand even the heaviest stresses caused by the cutting action as the sheet is fed through the machine. The back gage slide bar is channeled to insure sheet retention and alignment as it moves through the machine. The back gauge may be quickly removed, leaving the machine throat open for free hand slitting.

Easy to read etched scales, one on either side of the machine, permit direct reading and quick setting of any cutting width from the minimum of

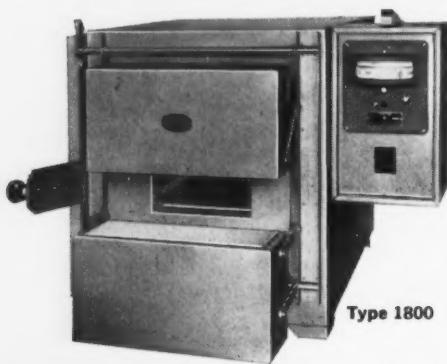


View of the Beverly Power Slitting Shear

1½ to the maximum of 30 inches.

A spring loaded sheet retaining roller automatically applies correct pressure to the inside cut edge of the sheet to keep in proper alignment. For more data circle 99 on Postpaid Card

the new BIG bench-type furnace for heavy production heat-treating



Type 1800

An all-new TEMCO electric furnace specifically designed to let you heat-treat more and bigger parts in a bench-type unit. Larger chamber size . . . 10" W. 9½" H. 22" D. Higher temperature range . . . continuous up to 2000° and 2300° F (1095° and 1260° C) . . . handles most high-speed steels.

This new Type 1800 TEMCO furnace features a close-sealing sectional door with patented lever suspension to provide limited or full access as desired. Reinforced welded steel case . . . 7½" firebrick and backup insulation. Choice of single or three-phase models, for 208, 230 or 460 volts. Available with or without controls. \$685 to \$745 furnace only.

Write for new TEMCO-THERMOLYNE Catalog and name of nearest dealer.

ELECTRIC FURNACES

Thermo Electric Mfg. Co.

488 Huff Street, Dubuque, Iowa



For more data circle 461 on Postpaid Card

NEW RANGE OF SIZES

DiaTest

HIGH PRECISION

SMALL BORE GAGE

- RANGE: .057" to 1.130"
- 4 SETS, fully equipped with rings and measuring heads.
- READINGS IN .0001"
- ACCURACY TO .00008"

DiaTest checks out-of-round, tapers, incomplete bores and all other variations. All sets overlap in size for complete range.

All parts available separately.

EACH SET
complete with
dial indicator.

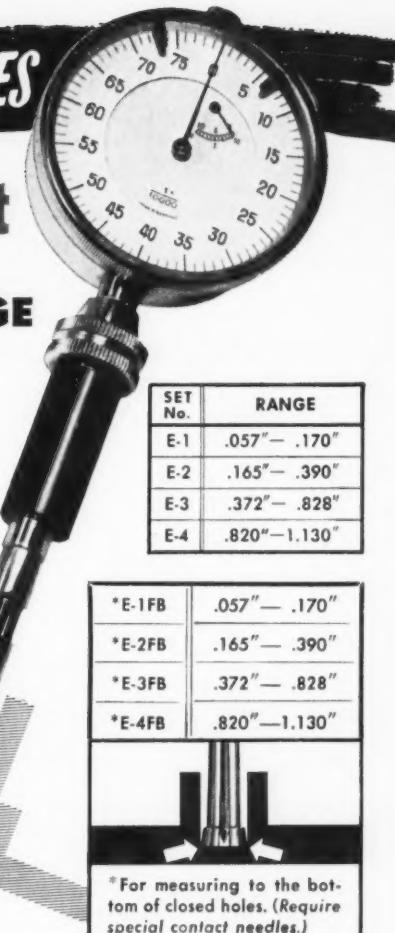


NEW ACCESSORIES

- RIGHT ANGLE ATTACHMENT
Permits gaging without removing work-piece from under bore spindle.
- EXTENSION RODS—may be used to length of 30" without loss of accuracy
- DEPTH ADJUSTER—used in conjunction with extension rods, permits gaging to any defined depth.

Write today, or call NEwcastle 1-8888
for full information!

*For measuring to the bottom of closed holes. (Requires special contact needles.)



FOSTER SUPPLIES CO.

6122 Milwaukee Ave., Dept. MMS, Chicago 46, Illinois
For more data circle 462 on Postpaid Card

new shop equipment . . .

PRECISION VERNIER CALIPER

Alina Corp., 122 East Second St., Mineola, L. I., N. Y., introduces a precision vernier caliper. This No. 17 Etalon Caliper has flush back jaws and extra long fully adjustable vernier plates. The caliper is dull chrome plated and will not chip or peel. It is



No. 17 Etalon Precision Vernier Caliper

exceptionally easy to read. Inside, outside and depth measurements are read from the same scale. Available in English or English-Metric combination.

For more data circle 100 on Postpaid Card

★ ★ ★

**SOLENOID
VALVES**

Skinner Electric Valve Division, Dept. LL165, 105 Edgewood Ave., New Britain, Conn., announces a series of high flow, three way, solenoid valves for general industrial use. These L3 Series Valves were designed to control oil, air, water, vegetable and petroleum



Skinner L3
Series Valves

Zero-Max. **for the SPEED you need**

**...on lead screw feeds
— for lathes and
grinders ... tables
... mills**

ZERO-MAX gives you the speed you need for finer finishes, quicker, more accurate positioning and longer blade, cutter, band and wheel life. This infinitely variable speed control is smoother and quieter than most other original power equipment. By merely moving a lever, you can change speed or direction at any time, running or not. Speeds from zero to 400 rpm— torque up to 100 inch-pounds. With or without motor, and with gearheads for multiplying speed range or torque up to 4½ times.

What's your rpm problem? Write for fully illustrated 16 page catalog.

The ZERO-MAX Company
subsidiary of REVCO INCORPORATED
1936 Lyndale Ave. S., Minneapolis 5, Minn.

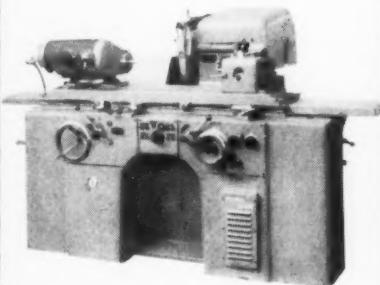


FRACTIONAL HORSEPOWER VARIABLE SPEED

For more data circle 463 on Postpaid Card

olivetti

high-precision grinding machines
with hydraulic automatic infeed
for traverse grinding and plunge grinding
as standard equipment on all models.



3 types:

UNIVERSAL. Swivelling wheelhead, swing-down internal grinding attachment, infinitely variable speed headstock.

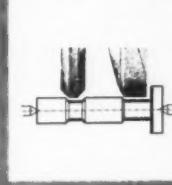
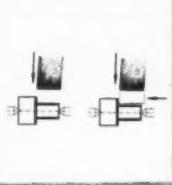
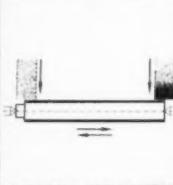
PRODUCTION. Larger grinding wheel, more horsepower, non-swivelling wheelhead, 8-speed headstock.

PLUNGE. Similar to production type but with axially oscillating wheelhead and hand table control only.

4 sizes:

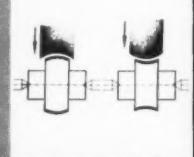
10", 12", 14", and 18" swings (with choice of lengths between centers).

Model R4-500 U shown at left. Universal type, 10" swing, 24" center distance.

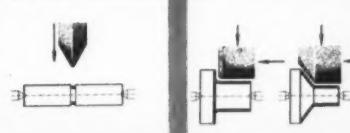


SOME STANDARD FEATURES OF OLIVETTI R4 UNIVERSAL GRINDERS:

- Infinitely variable hydraulically controlled table speeds
- Table reversals within $\pm .0002"$ as short as $1/16"$
- Table dwell 0 to 20 seconds
- Automatic precision infeed to $.000050"$, right, left or both ends of traverse
- Thumb jog for taking $.0001"$ cuts on diameter
- Separate automatic plunge feed 0 to $.002"$ second to positive stop



For sales, service or information,
write Olivetti Corporation of America,
Machine Tool Division, 42-33 Northern
Boulevard, Long Island City 1, New York
Or phone RArenswood 1-7575.



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new shop equipment . . .

oils, inert gases, kerosene and gasoline. They are compact, light, mount in any position directly to the line, and operate on a pressure differential of 5 to 150 p.s.i. These valves are available in $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ inch full effective orifice sizes, normally open, normally closed and with directional control in standard and explosion-proof construction.

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HIGH-SPEED LOW-COST KEYWAYS

You can cut accurate, low-cost internal keyways at *minimum* cost with Davis Keyseaters. Here's why: (1) operation is designed for production *speed*; (2) machine sets up easily, does *not* require skilled operator; (3) maximum concentricity of the keyway in each bore assured; (4) Built in 2 sizes. Keyways range from $\frac{1}{16}$ " to 1". High speed steel cutters stocked in all sizes; (5) the *best* keyseater of its type, yet *inexpensive*! Write now for *FREE DETAILED LITERATURE*!

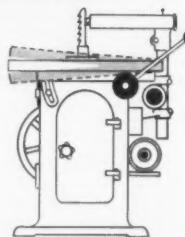


DAVIS KEYSEATER COMPANY

DIVISION OF *Hansford* MANUFACTURING CORPORATION

1239U University Ave., Rochester 7, New York

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Tilting table sets easily for tapered keyways up to 3" per foot.



Safety Multiple Lockout is insulated

SAFETY MULTIPLE LOCKOUTS

The Dayton Rogers Mfg. Co., Minneapolis 7D, Minn., has a new design of safety multiple lockout, made of all bakelite laminated material. These lockouts are made of 3/16 inch laminated bakelite.

They are primarily adapted to all electrical applications where two or more men are working on a given power switch line. It will give full protection on all such types of electrical operations.

Each workman is supplied with his own individual padlock, and may be inserted in any one of the seven positions provided. When the last individual padlock is removed from the multiple lockout, the line can then be closed and full power source resumed.

This all-insulated multiple lockout gives the maintenance people the desired safety protection in all such electric switch operations and controls.

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Buy safe "SHUR-GRIP"



drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes re-molding easier, quicker, surer, less expensive.
Write for circular and prices
COOK'S LEAD HAMMER SERVICE
67 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

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Universal "FULL-FLO" COOLANT NOZZLES with AERATOR

Ask for IPB-Sec. 2A Bulletin

Quality... ALL METAL FLEXIBLE HOSE PRODUCTS
UNIVERSAL METAL HOSE CO.

2113 South Kedzie Avenue, Chicago 23, Illinois

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DYKEM STEEL BLUE

Stops Losses

making Dies and
Templates

Popular package
8-oz. can fitted
with Bakelite cap
holding soft-hair
brush for applying right
at bench; metal surface
ready for layout in a few minutes. The dark blue background
makes the scribed lines show up in
sharp relief, prevents metal glare.
Increases efficiency and accuracy.

Write for sample on company letterhead
THE DYKEM COMPANY
2301F North 11th St. • St. Louis 6, Mo.

With DYKEM Steel Blue

Without DYKEM Steel Blue

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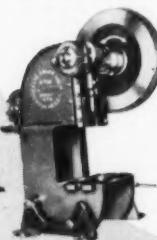
Moderate
in Price



Model BT-12
12 Ton—\$437.50
less motor—fob

Thousands in Use
the World Over

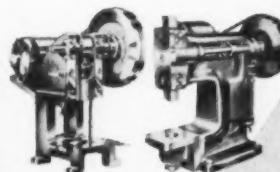
Powerful
Dependable
Economical
Fully
Guaranteed



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8 Ton
\$347.50
less motor
fob

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with motor—fob

Model B-2—2 Ton
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less motor—fob



Model LTX
Special Duty
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less motor—fob

ALVA ALLEN INDUSTRIES, Dept. M M
Clinton, Missouri

Tel. TURNER 5-3331

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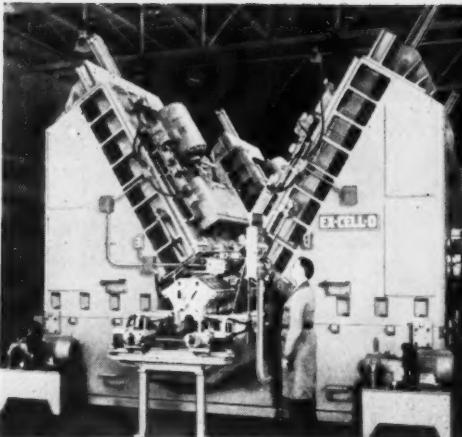
new shop equipment . . .

CUSTOM TRANSFER MACHINE BORES LARGE ENGINE BLOCKS

Ex-Cell-O Corp., Detroit 32, Mich., announces a custom transfer machine which is 18 feet wide and 15 feet high, designed to rough bore 6, 8 and 12 cylinder diesel engine blocks with comparatively little changeover time.

The machine comprises load and unload stations, with two working stations interposed by an idle station. This latter becomes a shuttle station with setup for the V-8 engine block. Transfer arrangements are incorporated in the setup to index the three different components.

The engine blocks are designed for wet liners. Consequently, boring is not a continuous process, but consists of machining at the top of the bore, midway and at the bottom. A system of dogs and limit switches monitor the

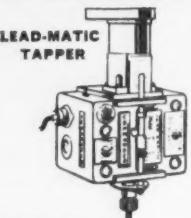


Massive Ex-Cell-O Custom Transfer Machine

feed and select the approximate skips to next feed position, as required for the job at hand.

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COMMANDER TAPPERS



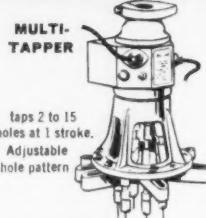
**LEAD-MATIC
TAPPER**

Lead Screw Tapper
Range: 0-80 to $\frac{1}{4}$ "-16



**PNEU-MATIC
TAPPER**

High Production,
Air Operated
Range: 0-80 to $\frac{1}{4}$ "-16



**MULTI-
TAPPER**

taps 2 to 15
holes at 1 stroke.
Adjustable
hole pattern



**MIDGET
TAPPER**

Adjustable
Torque Control
Range: 0-80 to $\frac{1}{4}$ "-16



**STANDARD
TAPPER**

Pressure Sensitive Drive
Range: 0-80 to 10-24

a Type and Size for Every Job!

Commander Tappers are made in 10 models—each designed to handle tapping jobs over a wide range. From the Commander Tapper line, you can select the right unit to give you the exact performance your job requires. Whichever Commander Tapper you select, you will get unequalled performance and tapping economy. Sold and serviced by drilling and tapping specialists. Write for the Commander Production Tool Catalog and name of nearest Distributor.



Commander MFG. CO. 4224 W. KINZIE STREET
CHICAGO 24, ILLINOIS

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"SEALFLEX" TUBING



Leakproof—
Stays in place
For Coolants, Cutting
Oils, Solvents
Made of steel with brass
fittings — males, nozzles,
stopcocks, etc., made in
1/8", 1/4", 3/8", 1/2", 3/4"
I.D. Write for bulletin and
prices.

VERMONT FLEXIBLE TUBING CO.
Lyndonville, Vermont

For more data circle 471 on Postpaid Card

JIG BORING

and

Large Precision Machining

Done to your specifications

We have 22 Jig Borers

KIDDE PRECISION TOOL CORP.
15 LOCUST AVENUE ROSELAND, N. J.

For more data circle 472 on Postpaid Card

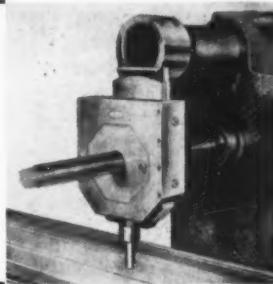
DORDEN Vertical Shaping Attachment

Fits directly on any 1" regular horizontal milling machine arbor. Adjustable cutting stroke to 3". Swivels in two directions for taper shaping.

Indispensable for punch and die work, gauges and any general tool work requiring inside shaping to close tolerance. Write for folder.

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matched prismatic lenses give needle-sharp magnification. Comfortably light weight. Fits over regular glasses. Leaves both hands free. Normal vision may be resumed by lifting head.

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With Third Dimensional (3-D) Vision
Leaves both hands free to work

Magni-Focuser—the binocular magnifier—reduces eye-strain and prevents squinting—thereby speeding production, increasing accuracy and minimizing the chance of errors and accidents.

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Magni-Focuser can help your plant produce better. Immediate delivery. 10-day trial without obligation. Return to us if not satisfied. \$10.50.

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Dept. P, 480 Lexington Ave.
New York 17, N. Y.

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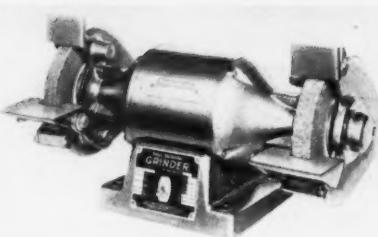
September, 1959

modern machine shop 227

new shop equipment . . .

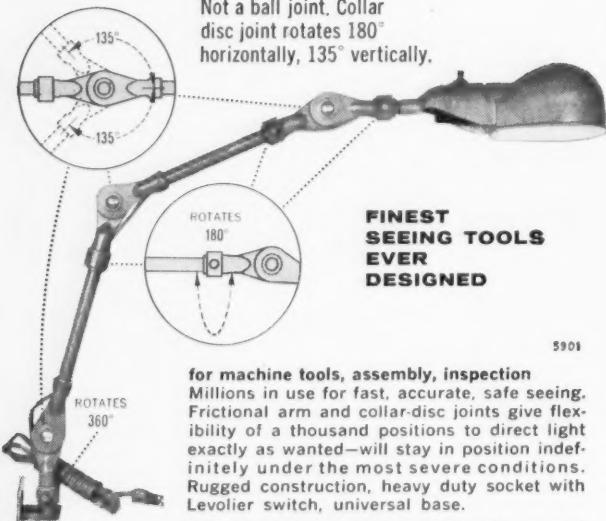
BENCH GRINDERS FOR BUFFING, GRINDING AND BRUSHING

Five models of bench grinders are offered by Porter-Cable Machine Co., 105 Seneca St., Syracuse 4, N. Y. The Model 166 is a $\frac{1}{4}$ h.p. standard duty and is designed for buffing, grinding and brushing jobs in home workshops,



Porter-Cable Ball Bearing Bench Grinder

FOSTORIA LOCALITES



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EVER
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5901

for machine tools, assembly, inspection
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85c ea. in Std. Pkg. of 4. Fits all old and new model Localite half shade reflectors.

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\$7.95 EACH
IN STD. PKG.
OF 4.

garages, farms, service stations and for intermittent duty in factories. It takes 6 by $\frac{5}{8}$ inch grinding wheels with $\frac{1}{2}$ inch bore and weighs 24 lbs.

There are four heavy duty models, each built for continuous use in automotive and machine shops, garages, foundries and maintenance shops. The Model 546 is a $\frac{1}{3}$ h.p. grinder, taking 6 by $\frac{3}{4}$ inch grinding wheels with $\frac{1}{2}$ inch bore. The Model 547 is a $\frac{1}{2}$ h.p. machine, taking 7 by 1 inch wheels with a $\frac{5}{8}$ inch bore and the Model 550 with 1 h.p. uses 10 by 1 inch wheels with $\frac{3}{4}$ inch bore.

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FOSTORIA CORPORATION • FOSTORIA, OHIO

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heats like...
is more modern than...
is more economical than...

GAS

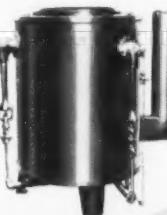
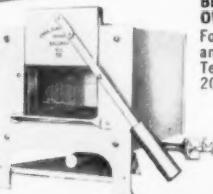


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for Clean, Fast, Quiet Heat-Up at Lowest Cost!

BENCH TYPE OVEN FURNACES

For heat treating and pre-heating. Temperatures to 2000° F.



ATMOSPHERIC POT FURNACES

For cyanide, salt bath and lead hardening. Temperatures to 1650° F.

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complete
"BUZZER"
CATALOG



Est. 1911

CHARLES A. HONES, INC.

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"BUZZER" Burners & Furnaces for Heat Treating, Melting, Soldering

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SUPER COMPARATOR

Gaging Head by **Mahr**

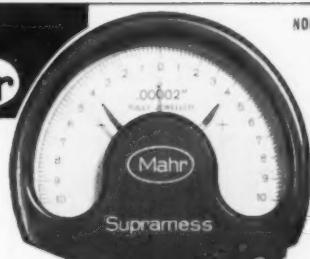
Reading in 20 MILLIONTHS of an inch

ACCURACY over entire range ± 10 MILLIONTHS
RANGE of dial $\pm .001"$
SPACE between graduation lines .0354"

... with these SPECIAL ADVANTAGES

- CONSTANT MEASURING PRESSURE and practically frictionless movements of all parts
- EXTREME MEASURING ACCURACY and MAXIMUM SENSITIVITY
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SUPER ACCURATE
The measuring pressure is 100 grams making this comparator most sensitive and accurate.



NON-GLARING
Dial and
hair thin
Pointer

Adjustable
Tolerance
Hands

Instant
Fine
Adjustment

PRICE
\$59.50
with plastic case

Fully jewelled
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Small in size for
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Overall dimensions
3-3/4" x 2-1/2" x 3/4" thick

Stands and
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available



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.000050" and .0005"
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HEADQUARTERS FOR
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INSTRUMENTS
AND FINE TOOLS

new shop equipment ...

GAGE HANDLE

The Foster Gage Handle offered by C. E. Foster Gage Corp., 5341 English Ave., Indianapolis 19, Ind., utilizes a revolutionary new concept, "Suspended Motion," which is said to provide faster gaging of tapped holes with reduced gage wear. The American Gage Design Standard, Taperlock or Reversible plug members up to three fourths inch pitch diameter capacity can be adapted to this handle.

In "Suspended Motion" gaging, the gage member is engaged a partial turn in the tapped hole in the conventional manner, then further operation is accomplished by reciprocal motion.

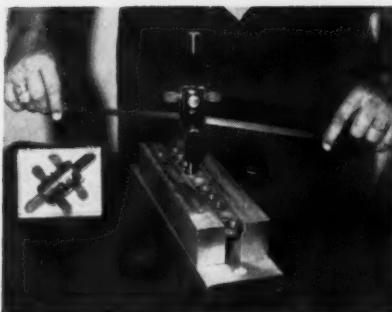


Illustration shows Foster Gage Handle in use

The pulling of two tabs outward from the gage handle imparts rotary motion to the gage. Rotation is continuous and the velocity of rotation is directly proportional to the reciprocal motion. Since both hands are engaged in pulling the tabs, external forces upon the gage handle are eliminated; thus, effectively reducing friction and gage wear. Reversal of the gage is accomplished by pulling another set of tabs. Regardless of plane, angle, or position of tapped holes, the operator can remain in relatively the same position when gaging, not so with conventional hand gaging.

Each Foster Gage Handle is packaged in an attractive plastic container which provides utility of protection and storage.

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GRIND THE

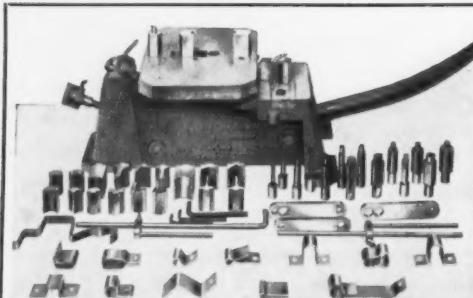
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Way***

**WE SPECIALIZE
20 CENTERLESS GRINDERS**

ESTABLISHED 1939

Eastern Centerless Grinding Co.
470 Tolland Street East Hartford 8, Conn.

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Multiform
BENDER CUTTER

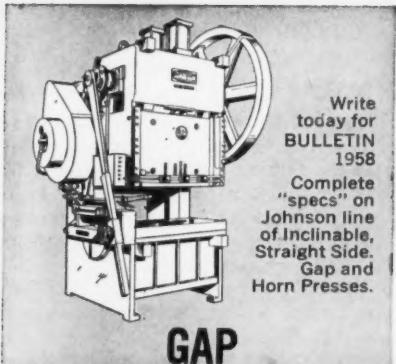
Users report the Multiform Bender one of the handiest tools in the shop. No special tooling . . . Bends, Cuts, Punches, Flats, Rounds into Any Shape, Brackets, Springs, Busbars, Wire Forms, Aircraft Work, and Steel Rule Dies for Metal Blanking.

**AIR OR HAND MODELS FOR UP TO
1/4" to 4" MATERIAL**

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Complete
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Inclined,
Straight Side,
Gap and
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GAP

Johnson

POWER PRESSES
JOHNSON MACHINE & PRESS CORP.
620 W. INDIANA AVE., ELKHART, INDIANA

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NIBBLING MACHINES

Patented Tool Holder Assembly →

NIBBLE your COSTS

- No sparks
- No open flame
- No oxidation
- No secondary operations

No. 236

Totally enclosed head . . . for safety.
Direct-over-center positive drive . . . gives more power.
One-piece 360° revolving head . . . for fewer parts and longer life.

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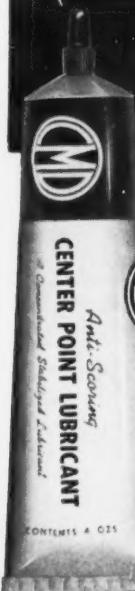
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KNOXVILLE  TENNESSEE

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September, 1959

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PERFORMANCE
for only**

\$100



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modern machine shop 231

FORCED AIR



FURNACE

The Lucifer Furnaces, Inc. Series 4055 furnaces are manufactured in ten standard models with 800° F. or 1250° F. maximum operating temperatures. These furnaces are designed for tempering, drawing, heat treating aluminum, and glass annealing. Each furnace is a complete unit . . . controls included. They are equipped with a large fan and motor to force circulation of air in the working chamber to insure maximum uniformity of temperature.

All electric heat treating furnaces by Lucifer feature • low initial cost • low upkeep • top production performance • minimum replacement down-time. For free engineering advice, parts, or product information . . . write, wire or call . . .

L U C I F E R
FURNACES, INC.

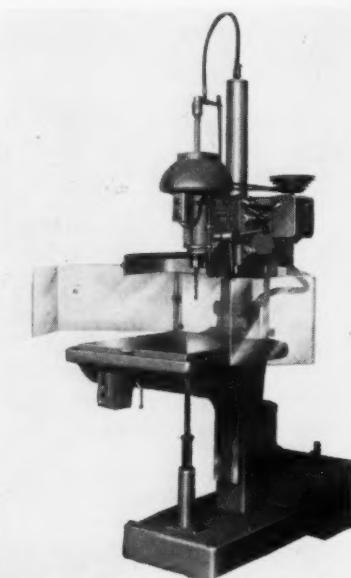
Neshaminy 6, Penna. • Diamond 3-0411
For more data circle 483 on Postpaid Card

232 modern machine shop

new shop equipment . . .

HOLLOW SPINDLE DRILL

Buffalo Forge Co., 388 Broadway, Buffalo, N. Y., announces a hollow spindle drilling machine, designed for use with the Mossberg Cold Point Drill and Hoffman Diamond Impregnated Bits at speeds up to 10,000 r.p.m. This machine has an accurately balanced hollow spindle, coolant system having a pump with a capacity to 100 p.s.i. to cool and flush away chips, special splash guards and a rubber-flex collet chuck. High pump pressure is not necessary when drilling glass or ceramics. City water piped to the spindle is sufficient. The manufacturer states that, with this machine, it is possible to handle heretofore impossible drilling jobs at production speeds. The company also claims that regular drilling can be done much faster.
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Buffalo Hollow Spindle Drilling Machine

September, 1959



MARK OF
QUALITY

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We manufacture a complete line of Woodruff keys in all standard sizes. These sizes range from as small as $\frac{1}{2}''$ x $\frac{1}{16}''$ to keys as large as $3\frac{1}{2}''$ x $\frac{3}{8}''$. All keys are carefully checked for burrs, slivers, etc., before being shipped to you. Only the finished tested keys are permitted to leave our plants.

We carry a complete stock of high quality, dependable keys. Send for our catalog for complete information on Woodruff keys, taper pins, machine keys, and machine racks.

STANDARD STEEL SPECIALTY CO.
BEAVER FALLS • PENNSYLVANIA

Plants: Beaver Falls, Pa.; Hammond, Ind.

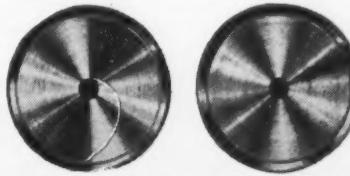
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the new RELIEVOMATIC* saves you costly refinishing!

No more rejects or refinishing because of marred surfaces made by cutting tools on their return pass! Now—the RELIEVOMATIC renders precise parts with perfectly smooth surfaces. For boring, turning or facing on automatic metal turning equipment.

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Nightingale 9-8600

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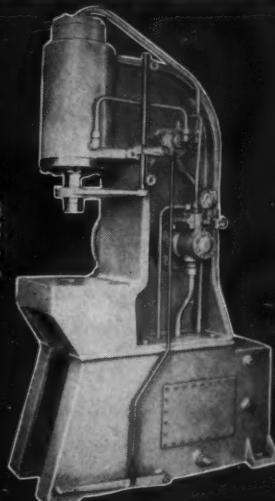
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1½-75 TONS

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Greenerd ARBOR PRESS CO.

41 CROWN ST. NASHUA, N.H.

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**SMALL DIAMETER BORING
HEADS FEATURE CONTINUOUS
RADIAL FEED**

Three continuous feed facing heads for small diameter boring, facing, turning, counterboring, backfacing, grooving and chamfering operations feature uninterrupted radial feed and

extreme accuracies. Designed for use with all types of rotating spindle machines, they cover a range of diameters from 7/16 (with a pencil boring tool) to a recommended maximum of 25 inches. Cutting diameter is controlled by the operator or by adjustable feed stops which may be preset accurately to required diameters. Radial feed is adjustable to 0.0001 inch or finer.

The compact, rigid tools manufactured by Davis Division, Giddings & Lewis Tool Co., Fond du Lac, Wis., have 4, 6 and 10 inch diameter bodies. They are available with standard or special shanks for spindle mounting or with flange adapters for sleeve mounting. Other design features include: an adjustable safety clutch which releases under overload; a clamping screw for fixed slide operations; and a manually operated rapid traverse for the slide.

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ALL ALLOY
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Two Sizes

PORTABLE

No. 1 cuts up to No. 11 gauge strip or sheet.
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MARKING

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**NAMEPLATE
DETAIL PRESS.**

- Simple Operation
- Perfect Alignment
- Uniform Depth

GEO. T. SCHMIDT, INC.



1000 W. BELLE PLAINE AVE.
CHICAGO • 13 • ILLINOIS

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September, 1959

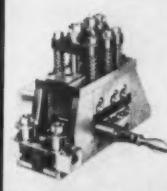
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**STANDARD STOCK
STRAIGHTENERS**

Made in nine standard sizes to meet most requirements. Widths from 2" to 8"; roll combinations range from 5 to 9. Special sizes available to specific requirements.



RAM SCRAP CHOPPER

Low cost, operated by press ram, independent of die. Easily bolted to press.

FOUR MODELS

- M1 takes stock 3" wide .062 thick
- M2 takes stock 6" wide .062 thick
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**AUTOMATIC
STOCK REEL**

Operates by natural spring of uncoiling stock. Platen turns on ball bearings. No motor, belts or sprockets. Loop of stock stops slippage, kick back, and over run. Speed limits controlled only by feed.



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DURANT Tool Supply Co.

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For more data circle 491 on Postpaid Card

modern machine shop 235

new shop equipment . . .

THREAD MEASURING WIRE CARRIERS

Carriers for the widely accepted 3-wire method of thread measurement are announced by Standard Gage Co., Inc., Poughkeepsie, N. Y. They are useful for checking wear of thread plug gages, for in-process inspection, and for receiving inspection.

Carriers are of two main kind—

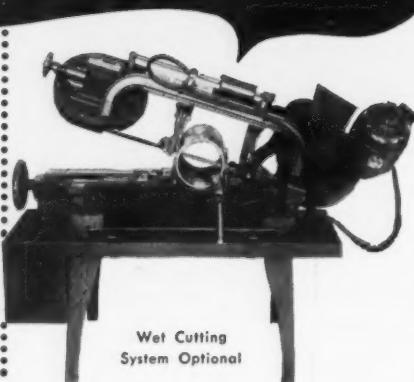
those for micrometers and those for measuring machines having $\frac{3}{8}$ -inch diameter anvils. Micrometer carriers are made especially for Starrett micrometers (0.234-inch spindle and anvil diameter; anvil height 0.070 inch minimum) and will measure the pitch diameter of American National and Unified 60-degree threads from No. 0 through $\frac{3}{4}$ -inch diameter, all standard pitches 10 through 80 threads per inch. Sets are available containing the 19 pairs of carriers for the above

range plus a micrometer and pair of measuring machine spindle adapters. A set is likewise available just for measuring machines, and covers all standard threads, No. 0 through 1 inch and 8 through 80 pitch. Manufacturer will supply individuals pairs of carriers of either type.

For more data circle 108 on Postpaid Card

The WELLS Model 600 Metal Cutting Band Saw

for
Tool and
Stock Room
Service
•
for
Medium
Production
Jobs



Rugged in design, dependable in operation, the Wells Model 600 is the ideal saw for tool and stock rooms . . . gives excellent service on medium production jobs. Uses $\frac{5}{8}$ " blade. Adjustable, uniform gravity feed is provided by hydraulic stabilizer and special coil spring. Casters available for portability. Write for Bulletin 260-A.



The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
808 Tyler St., Three Rivers, Michigan

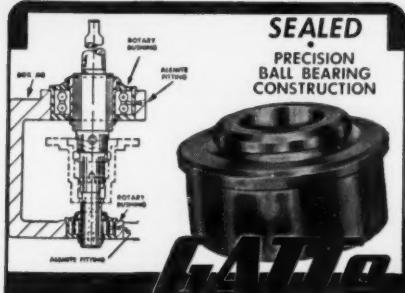
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236 modern machine shop



**Micrometer equipped
with Standard
Thread Measuring
Wire Carriers**

September, 1959



SEALED
PRECISION
BALL BEARING
CONSTRUCTION

ROTARY BUSHINGS

FOR DRILLING, CORE DRILLING
ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work - or both.

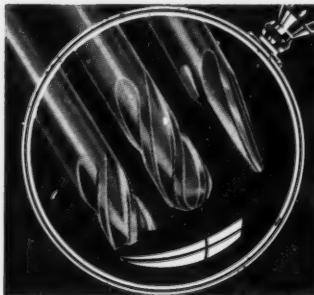
Eliminates expensive tool construction - Reduces tool wear - Prevents seizure and pilot breakage - Especially adapted where precision is required.

Write for full information and prices

ROTARY BUSHINGS

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Telephone Glenview 3-2295

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10 to 20 Times Longer
Cutting Life Means
Lower Tool Costs

"DIXIE" provides End Mills of solid carbide with cutting edges processed with exclusive "Micro-Finish" to assure the user of long-lasting, super sharp tools.

FOR PRECISION FINISHING



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AND CUSTOM TOOLING

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NEW CATALOG

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BRIDGEPORT, MICHIGAN

For more data circle 494 on Postpaid Card



WORKS like a charm

Clover Coated Abrasives, like any other tools, really do no work at all by themselves; but they have a way of lasting, through use and abuse, that makes many a craftsman think of Clover as a partner.

There are good reasons for this lasting quality. First of all, every Clover Coated Abrasive is made to meet the standard of the best in its class. Second, the Clover line is complete — you can find a Clover Coated Abrasive item that is made for your job.

Ask for the new Clover Catalog to get acquainted with our full line of working-partner abrasives.

Clover Manufacturing Company

Norwalk, Connecticut

Victor 7-4515

Makers of the famous

CLOVER Grinding and Lapping **COMPOUNDS**

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September, 1959

modern machine shop 237

new shop equipment . . .

**CROSS SLIDE TABLE
IS CONSTRUCTED OF
MEEHANITE IRON**

Lawrence H. Cook, Inc., 67 Massasoit Ave., Providence 14, R. I., introduces a lightweight, low cost precision cross slide table that is constructed with all castings of Meehanite iron. The top and bottom are precision

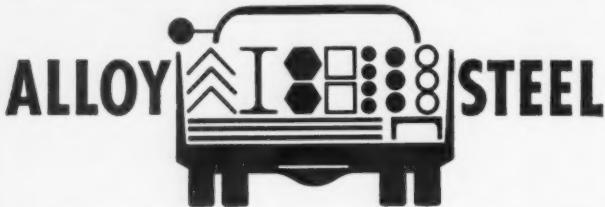


L. H. Cook Precision Cross Slide Table

ground, while all ways and gibbs are hand scraped. The table top is 8 by 12 inches; it has four tee slots with 6 inch scales on each slide. The dials are graduated from 0.001 to 0.050 per revolution. It has heat treated and precision ground lead screws with 2½ inch long bronze nuts.

This unit is only 15 inches long and 4 inches high. It will fit all rotary tables 12 inches or more or radii and angle milling on all vertical milling machines. This makes it especially adaptable for all work on mold cavities, plungers, dies and templates, producing high quality workmanship in a minimum amount of time.

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**WHEELOCK,
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& COMPANY, INC.**
140 Sidney Street, Cambridge 39, Mass.

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September, 1959

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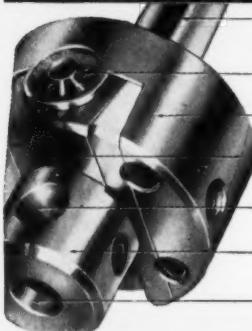
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Telephone: ADams 2-7300

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GROUND AFTER
HARDENING

HOLDS TOOL
VERTICALLY

SAFETY ROUND
TOOL BLOCK

HOLDS TOOL
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ENCO Manufacturing Co.
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Please send catalog #53 and full details of
ENCO HEXTURRETS.

Name _____

Firm _____

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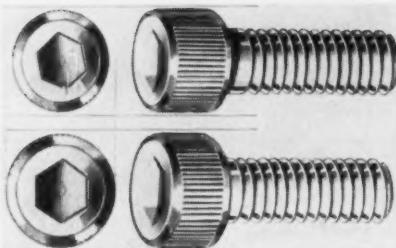
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new shop equipment . . .

COLD FORGED SOCKET HEAD CAP SCREWS

Set Screw & Mfg. Co., Bartlett, Ill., announces a complete line of cold forged socket head cap screws, manufactured to the new standards agreed upon by the A.S.A. The new line of cap screws is in addition to the presently accepted standard types. Both



View of Setko Socket Head Cap Screws

WILLEY'S Pentagon

UNCONDITIONALLY GUARANTEED

to out-perform any other style of carbide throw-away insert—for straight turning, boring, or facing applications—on any kind of material.



The pentagon is a cam ground, radii tangent, indexable insert of solid carbide. It presents 10 cutting edges at a 30° lead angle and each edge will produce more finished work than the edge of any other standard insert.

Not on tests alone—but in actual production; on various operations; machining all

solid carbide



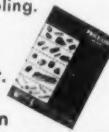
indexable insert



types of materials—Willey's Pentagon more than doubled the best performance of all other inserts tried. It is proven superior . . . we guarantee it.

Try the pentagon! You'll save money. You'll do a better job—faster, and once used you'll never go back to fragile . . . high-cost . . . yesterday's tooling.

A complete catalog of Willey's carbide tool products is available on request.



Send your part print and present tool layout for prompt quotation

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that it's PARALLEL?
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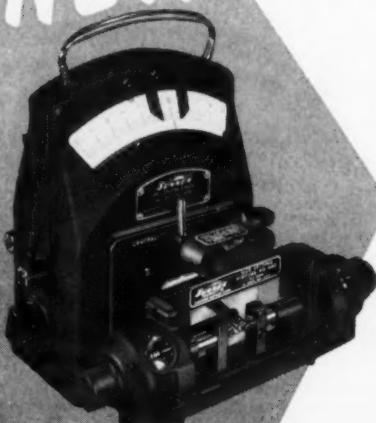
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September, 1959

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types are available to meet the requirements of industry.

Main features of the new type cap screws are the larger head and the bigger hex wrench pads.

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INSERTS ARE SELF-LOCKING AND SELF-RIVETING

J. B. Plevyak Mfg. Co., 19 Jefferson St., Newton, N. J., announces self-riveting Perma-lock Inserts for sheet metal and non-metal sheet applications.

No upsetting tools or operations are required to install the inserts, which are knurled to prevent rotation. The inserts, which can be used to fasten two or more sheets or parts, are available in No. 4 to 9/16 inch screw sizes with fine or coarse threads. They can

be supplied in mild steel, brass, bronze and aluminum. Other sizes of inserts in other materials can be furnished on special order. Designed to resist vibration, the inserts are also available in headless styles for flush applications. For more data circle 111 on Postpaid Card

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SURFACE PROTECTION COMPOUND

"Protex," a special surface protection compound which can be used with the Arcair Process, is announced by The Arcair Co., P. O. Box 431, Lancaster, Ohio. Special because the air blast coming from an Arcair torch will not blow it away from the surface being worked, Protex is applied to the surface with an ordinary paint brush and there is no waiting period for it to dry before beginning work with an Arcair torch. Though not required on most metals during Arcair operations, it is especially valuable for use on

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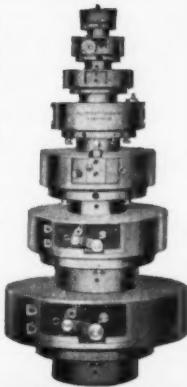
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MUMMERT-DIXON FACINGHEADS

Two-way tool feed in 9, 12, 16, 20, 24, 30, 36, 40 and 46 sizes.

One-way tool feed in 6, 9 and 12 sizes. Automatic feed — convenient tool adjustment — quick feed reverse. Save time and costly set-ups.

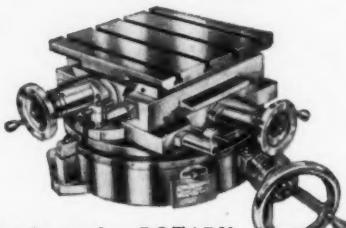
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120 PHILADELPHIA ST. • HANOVER, PA.

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STEVENS—THREE-IN-ONE ROTARY COMPOUND TABLES IN 3 SIZES



Can be used as ROTARY COMPOUND TABLE or separated to use *individually* as Compound table *alone* and Rotary table *alone*—all on one investment.

The Stevens-Three-in-One will save set-up time and reduce inaccuracies caused by multiple set-ups.

See your dealer or write for bulletins

The John B. Stevens Company
Main Street, Somersville, Conn., U. S. A.

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September, 1959

for as little as
\$ 22.00
COMPLETE
IN U.S.A.

Get This Production Boosting ‘TRICO-MIST’ COOLANT SYSTEM

With Flexible Armored Coolant Lines and Kwik-Change Nozzle With Guard



For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers—single or multiple outlets—single or dual valve control.

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TRICO FUSE MFG. CO.
MILWAUKEE, WIS. U.S.A.

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stainless steels, machined surfaces, and similar applications. It can also be used to advantage for welding operations, and to prevent the formation of scale during heat treat or stress relieve operations. After use, it is easily wiped off with a dry cloth.

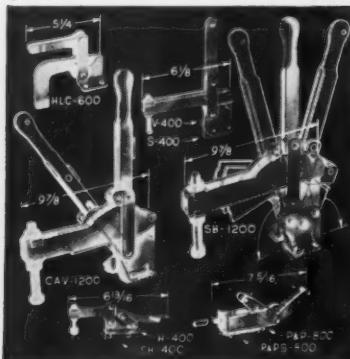
One gallon is said to protect as much as 3,000 square feet.

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Manufacturers of over 150 models of manually and air-operated clamps and pliers.

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CANADIAN DIV.: HIGGINSON EQUIP. SALES, 1131 Pettit Road, Burlington, Ontario

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COLLET ADAPTER SPEEDS TOOL CHANGES

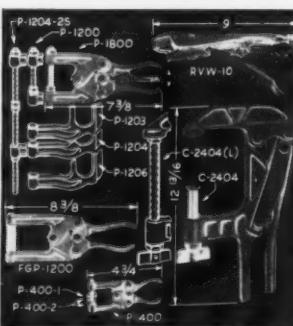
A collet adapter, designed to speed up tool changes on both horizontal and vertical mills, jig borers, boring bars and other machines, is announced by Tree Tool and Die Works, 1600 Junction Ave., Racine, Wisconsin.

This Rapid-Lok Adapter was designed to speed up tool and cutter changing without the use of adapters, drawbars or wrenches.

Through a mechanical leverage, produced by internal balls and tapers plus the lugs of the locking lever, cutters and tools are held with maximum power. Holding pressure is evenly distributed on the tool, assuring good concentricity with minimum runout.

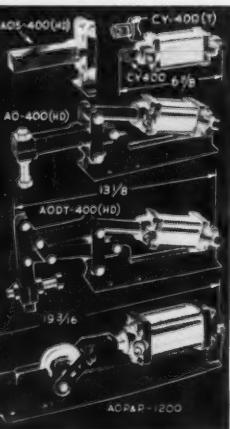
Rapid-Lok is available in six styles to accommodate the spindle tapers on a wide range of machines.

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They were developed through exhaustive tests in laboratory and years of practical use.



R a p i d - L o k
C o l l e t A d a p t e r

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PIONEERS
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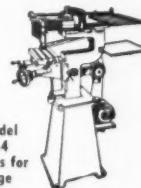
September, 1959

for 2 and 3 DIMENSIONAL PRECISION ENGRAVING

on steel, plastic and other metals
you can be sure when you specify

PREIS

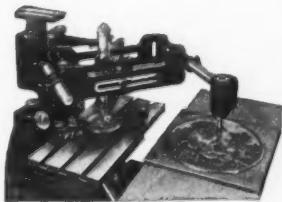
The PREIS-PANTO line of engraving machines and accessories are precision built and light in weight but engineered for service by experienced engraving machine specialists who know how to design and build engraving machines.



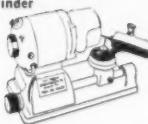
Model
2D-4
tops for
large
area
engraving.



Model
UE for
engraving
plastics
and
metals.



Model
CG
Sturdy
Precision
Cutter
Grinder



Illustrated above is the Model 3D-5 Three Dimensional Engraving and Die Cutting Machine. Features reversible spindle for enlarging or reducing from a model, die or sample.

Write for complete literature and prices. For immediate attention write directly to manufacturer below. Ask for nearest representative.



H. P. PREIS ENGRAVING MACHINE CO.
657 U.S. Route 22, Hillside, N. J.

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modern machine shop 245

new shop equipment . . .

TWO-STAGE HYDRAULIC POWER PACKAGE

A two-stage hydraulic power package, which delivers from 600 cubic inches of oil a minute at 100 p.s.i. to 50 cubic inches of oil a minute at 10,000 p.s.i., and weighs only 45 lb. has been announced by the Precision Hydraulics Division, Owatonna Tool Co., N. Cedar St., Owatonna, Minn.

Overall pump dimensions are 10 $\frac{3}{4}$ by 12 $\frac{1}{2}$ inches and 17 $\frac{1}{2}$ inches high.

The new OTC "Vanguard" complete pumping unit is a quiet-operating, precision-built, two-stage unit, driven by a universal motor, and consisting of a gear pump for the low pressure stage and a five-cylinder axial-piston pump (which is supercharged by the gear pump) for the high pressure stage. A variety of valves, controls and accessories are available and can be easily mounted to meet various specific requirements of the user.

Reservoir capacity is two gallons, with 1 $\frac{1}{4}$ gallons of usable oil. Common cover plate, on which pump, motor and valving are mounted, makes possible the use of different size reservoirs. "Vanguard" suction head of 2 $\frac{1}{2}$ feet permits pump to be used with a relatively deep reservoir such as an oil drum.

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mill supply
house or
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BB-159

Greater accuracy, more work in less time, longer tool use—you get them all with Maxwell's new Mastur Boring Head line.

Adjustable to 0.0001-inch, Maxwell's new improved boring tools feature an adjusting-screw head graduated for readings in thousandths, with body having vernier readings of 0.0002-inch. Four standard models for tools $\frac{3}{8}$ " to 1" diameter, and up to 3" in specials. Boring range from $\frac{3}{8}$ " to 15". AA-9872

MAXWELL INDUSTRIES, INC.

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"Vanguard" Hydraulic Power Pump

MICRO CENTER DRILLS



and COUNTERSINKS

No.	Diameter		Length		Price Each	
	Drill	Body	Drill	Overall	Right Hand	Left Hand
00	0.020"	W"	W"	1 1/8"	\$1.45	\$1.70
01	0.025"	W"	W"	1 1/8"	1.20	1.50
0	1/32"	W"	W"	1 1/8"	1.10	1.35
1	3/64"	W"	W"	1 1/8"	.95	1.20
2	1/16"	W"	W"	1 1/8"	1.00	1.20
3	3/32"	W"	W"	2"	1.00	1.30

60 degree—S.H.S.
Ground from the Solid and Hardened Rod
A Tool of exceptional Quality
A Tool for the Hard to do Job
Available immediately from stock

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D R I L L
P R E S S E S

Duro Drill Presses are precision units, offering extra capacity, extra features at no extra cost! It is the only line that permits "custom selection" from the largest array of models in the power tool field. The Duro Line includes single and multiple units, in 15 1/2" and 18" sizes, with or without production tables and bases, with optional foot feeds, in bench or floor models. Each unit has sealed-for-life ball bearings, precision bored bearing seats, ground alloy spindles, vibration free head castings, sturdy cast hinged belt and pulley guards; adjustable feed tension, plus many others.

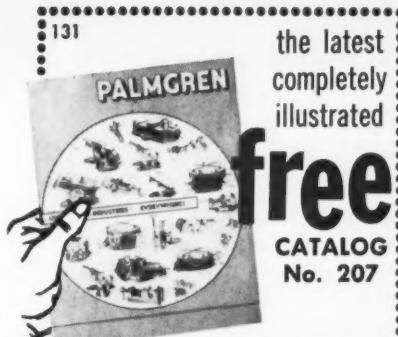
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tion, tooling and maintenance.

68 different models and types.
Vise jaw sizes from 1 1/2" to 8".

PALMGREN STEEL PRODUCTS
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**HEAVY DUTY
GEAR LUBRICANT**

"Molykote" Type 223X, a heavy-duty gear lubricant available in SAE 90 and 140 grades, has been announced by The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn. Made from the highest quality solvent-

refined paraffin base stock plus a special formulation of E.P. additives which include Molykote Type M-55, the new Type 223X is designed to provide satisfactory lubrication wherever the following problems are encountered: (1) gear cases operating at excessive frictional temperatures; (2) unsatisfactory wear life; and (3) gears loaded beyond the recommendations set forth by the manufacturer.

The new gear lubricant is said to have equally good load carrying ability through the entire range from the lowest to the highest sliding velocities and it is most effective in reducing wear. Molykote Type 223X has a viscosity index of 100. Its flash point is 390 deg. F. and its fire point is 420 deg. F. Its specific weight is 7.5 pounds per gallon and the lubricant has a pour point at 0 deg. F., contains a foam depressant, and is corrosion and oxidation inhibited.

**TORC-PAC
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DRIVES
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Guaranteed

**FOR 18 MONTHS
AND THAT'S NOT ALL**

The unique new Clearing Torc-Pac is not just the finest design in the press field—it's the finest in quality and performance. That's why Clearing can guarantee the drive on these 22, 32 and 45 ton presses *for 18 months*. You get more for the money when you buy a Torc-Pac and more in performance too. Write for details.

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REICH—THE ONLY 3-WAY PRECISION TEST INDICATOR

Accurate and repeated reading in either direction. No mirror needed to read both sides or top. Non rust, non magnetic movement. .014" reading.

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J. R. REICH MANUFACTURING CO.

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**SAFETY / G.R.D. STYLE B
MARKING FIXTURE**

A product of the Marking Device Industry

M. E. CUNNINGHAM CO.

1051 CHATEAU STREET, PITTSBURGH 33, PA.
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September, 1959

True Conical Grinding on a STERLING Drill Grinder gives you Faster Cutting Drills and More Holes per grind

Conical grinding of a drill point produces the same clearance angle from O.D. to web. The drill enters the work easier, cuts a uniform chip that requires less pressure, less power.

STERLING "DV"

\$590.00

F.O.B. Eau Claire, Wis.



CAPACITY

90°—140° Included angle, variable clearance angle set with built-in gage. Grinds 1/8" to 2 1/2" drills; 2, 3 & 4 flutes.

Set-up is simple and fast because no chucks or collets are used. Built-in diamond wheel dresser produces a finished cutting edge that stands up longer. You get more, accurate holes with drills ground on a STERLING "DV".

Ask your STERLING Dealer for complete information on all STERLING Drill Grinders and STERLING Tool and Cutter Grinders or write direct

**McDONOUGH
MANUFACTURING CO.**

1521 GALLOWAY • EAU CLAIRE, WISC.

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new shop equipment . . .

IMPROVED SURFACE GRINDER

Harig Mfg. Corp., 5747 W. Howard St., Chicago 31, Ill., announces new improvements on its TML 6x12 Surface Grinder. The company states the TML oiling system has been redesigned to provide more oil on the ways—to increase machine life and promote ease of operation. Also, hardened ways are offered as an optional feature.

For more data circle 116 on Postpaid Card



*"We've tapped over
2,000,000 holes
without any service
or repairs on our
new Tapmatic Attachment!"*

William W. Wachtel, General Manager,
Jonathan Mfg. Co., Fullerton, Calif.



"We feel that this tapping attachment is an important factor in the production of the Chassis Slide Rails we manufacture for the electronic, aircraft and missile industries. Components are tapped with #4-40, #8-32 and $\frac{1}{4}$ "-20 fluteless taps at speeds up to 2200 rpm.

"Our Tapmatic Attachments consistently produce excellent quality threads in the aircraft quality aluminum that we use. Tap breakage has virtually been eliminated even though many of these holes are

bottom tapped blind holes."

JOB DATA

Company:	Jonathan Mfg., Fullerton, Calif.
Attachment:	"New TAPMATIC High Speed Reversible"
Part:	Chassis Slide Rails
Material:	Aircraft Quality Aluminum
Tap Size:	#4-40, #8-32 and $\frac{1}{4}$ "-20
Type Tap:	Fluteless
Speeds:	To 2200 rpm
Machine:	Drill Press

*Available for both reversing
and non-reversing spindles,
TAPMATIC Tapping Attach-
ments, with capacities from #00
to 1" are the modern solution
to your tapping problems.*

TAPMATIC CORPORATION
845 W. 16th Street Costa Mesa, California

For more data circle 521 on Postpaid Card

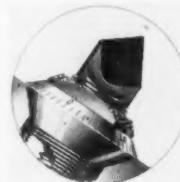
250 modern machine shop

TITANIUM CARBIDE AND CERAMIC TIPPED TOOLING

DeVlieg Microbore Division, DeVlieg Machine Company, Fair St., Royal Oak, Mich., announces titanium carbide and ceramic tipped Microbore tools which are said to produce excellent surface finish, in some instances comparable to ground finish. Both the titanium carbide and ceramic tipped Microbore tools are cone relief ground to gage room accuracy as are all Microbore tips. Cone relief grinding is said to provide uniform clearance around the profile of the cutting edges resulting in maximum tool life.

Due to the high rigidity of the basic Microbore design, which consists of a double cone bearing and axial locking force, there is a minimum of overhang between cutting tip and cone seat assembly, thus providing the rigidity necessary for maximum benefits from the new cutting materials.

For more data circle 117 on Postpaid Card



*Close-up view of
Microbore Tool show-
ing new tip design*

September, 1959

1 MAN + 1 BENDER

BENDS ALL THESE:

HOSSFELD UNIVERSAL® IRON BENDER



ROUNDS

FLATS

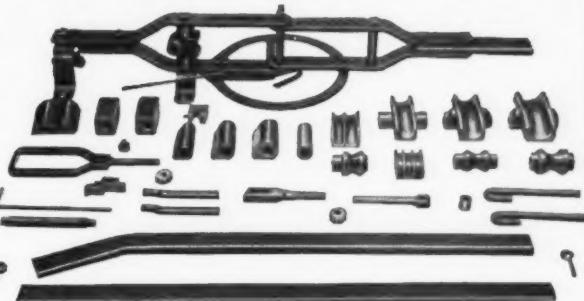
SQUARES

ANGLE

IRON

PIPE

TUBING &
CONDUIT



Bender Shown With Regular Equipment

FREE!

WRITE FOR
BULLETIN

HOSSFELD MFG. CO.

404 W. Third Street, Winona, Minnesota

For more data circle 522 on Postpaid Card



NEW 5 Ton and 15 Ton Deep Throat

PRESS-RITE
O.B.I.
PRESSES

12" THROAT DEPTH accommodates many trimming, drawing, forming, blanking and punching operations on metals, leather and plastics that would otherwise have to go on larger presses.

PRESS-RITE DIV.

The RUGGED FRAME is a steel weldment, heavily reinforced at points of strain to provide maximum rigidity when the press is operated at full capacity.

The heavy duty features of PRESS-RITE models to 85 Tons built into this press make it an extra rugged unit. For complete information ask your PRESS-RITE Distributor or write for Bulletin 459.

PRESS-RITE O.B.I. Models from 2 Ton to 85 Ton. HAVIR (formerly DIEBEL) Hi-Production Automatic Models, 5 Ton to 150 Ton.

Sales Service Mfg. Co.
2361 University Ave. • St. Paul 14A, Minn.

For more data circle 523 on Postpaid Card

new shop equipment . . .

INSULATING GAGE GRIP

Huron Machine Products, Inc., P. O. Box 2274, Dearborn, Mich., announces a new and improved plastic insulating grip that is highly resistant to heat and is guaranteed not to crack. Grips are made to American Gage Design Standards for master setting discs and are made in black, red or green.

For more data circle 118 on Postpaid Card

BENCH PRESS IS DESIGNED FOR FABRICATING SMALL, PRECISION PARTS

A high speed bench press, developed for the fabricating of small precision parts, is announced by the Hudson Division, Emhart Mfg. Co., Hudson, New York.

Built to operate at 450 to 900 s.p.m., this addition to the Emhart V & O line of high speed presses has a capacity of 5 tons, a dovetail slide or round shank hole and a counter-weighted shaft.

It has a $\frac{3}{8}$ inch eccentric stroke, a shut height of 8 inches and an automatic lubricating system. Driven by a $1\frac{1}{2}$ horsepower ball bearing motor, the press is equipped with a V & O air clutch that is electrically controlled.

For more data circle 119 on Postpaid Card

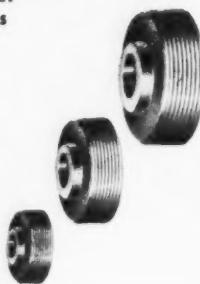
Save Money...Save Time
by using

STANDARDIZED THREAD ROLLS

**For Nos. 83 and 84 Brown & Sharpe Holders,
Reed Series A Holders and other
similar Type Single Roll Holders**



Both tool engineers and purchasing departments appreciate the saving of time, effort and money made possible by being able to order Reed standardized thread rolls by type number only, without the necessity of submitting drawings and specifications.



**ROLLS for COMMON STRAIGHT THREADS
and TAPER PIPE THREADS
CARRIED IN STOCK**

For Your Convenience in Ordering

Standardized Thread Rolls and Holders

Write for Thread Roll Bulletin 1-17 and Price List

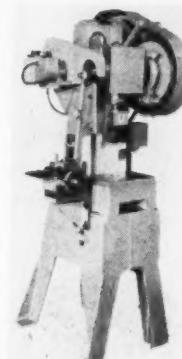


REED ROLLED THREAD DIE CO.

Suppliers of Thread and Form Rolling Tools and Equipment
Holden, Mass., U.S.A.

For more data circle 524 on Postpaid Card

252 modern machine shop

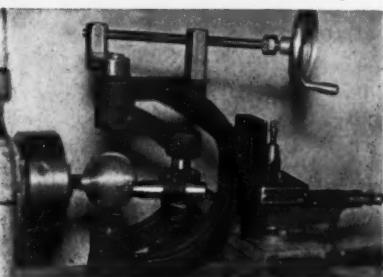


V & O Bench Press

September, 1959

New

RADITURN ✓



CUTS ANY RADIUS Convex, Concave or Ball

Patented

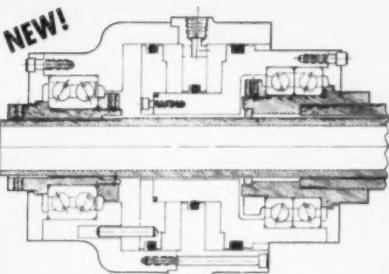
The accurate short cut for turning any radius. Adaptable to most any lathe.

Contact your tool supplier or write for details.

RETCO MFG. & SALES
1458 E. CLINTON • FRANKFORT, IND.

For more data circle 525 on Postpaid Card

NEW!



Power Grip CHUCK ACTUATOR

For Bar and Chucking Work. Hole in air chuck and Actuator converts chucker to bar work.

For High Speed. Vibrationless Holding. No limit on spindle speeds.

For Frequent Starting and Stopping. No rotating mass to create flywheel effect.

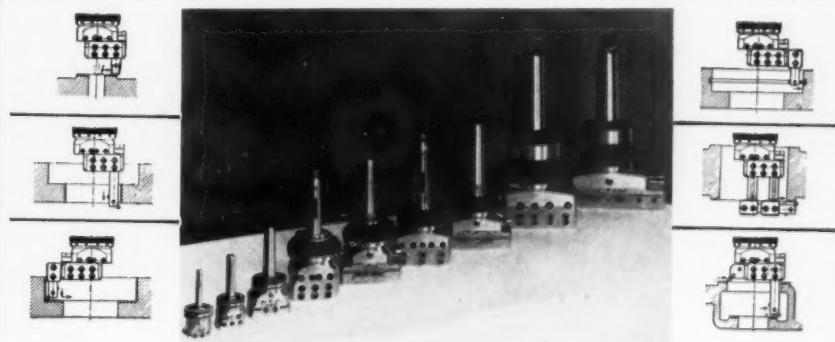
For Constant Holding Pressure. Regulated air pressure provides consistent holding.

For Feeding Coolant, Cutting Tools, or Work Pieces Through the Spindle.

For further information, write

Power Grip, Inc. • Rock Fall, Conn.

For more data circle 526 on Postpaid Card



NOW! Cut Costs! Use Highest Precision WOHLHAUPTER Facing and Boring Masterheads
Facing, Boring, Turning, Recessing, Undercutting, Underfacing and Tapercutting

- Automatic Feeds
- Automatic End Release
- 9 Sizes for Work to $36\frac{1}{4}$ "
- 12 Feeds in Larger Models

Also Tapercutting Heads for $0-180^\circ$

FREE! For illustrated catalog containing complete technical data, write today!



Sole Agents

KARL A. NEISE

Dept. MM-99

404 - 4th Ave., N.Y.C. 16

For more data circle 527 on Postpaid Card

new shop equipment . . .

SOLID CARBIDE DRILLS

Rotary Tool Industries, Inc., Dept. MM, 4461 West Jefferson, Detroit 9, Mich., has added to its line of standard spiral solid carbide drills three new series of fast spiral drills. Drills are available in either standard or fast spiral in fractional sizes of 1/32 to 1/2 inch, letter size A through Z and



Rotary Fast Spiral Solid Carbide Drill

wire gauge size 1 through 70. In addition, a series of metric sizes has been added in standard spiral from 0.7 to 10.0 millimeters.

For more data circle 120 on Postpaid Card

★ m m s ★

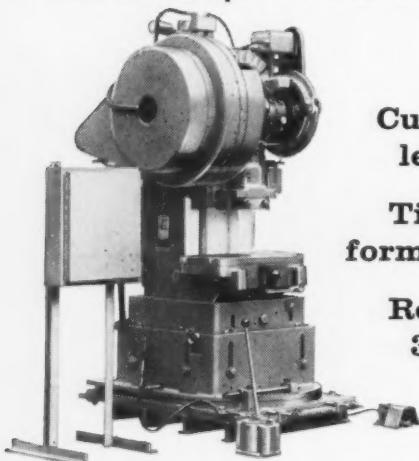
CARBON TOOL STEEL

Known as Hedervan, a special carbon tool steel produced by Latrobe Steel Co., Latrobe, Pa., is particularly designed for cold heading applications—the high speed, long run production of nuts, bolts, rivets and the like. Because of its long wearing qualities the steel is also recommended for cold striking dies, cold coining dies, tube drawing dies and mandrels, rotary swaging dies, hammers and rolls, and punches.

Hedervan is essentially a 0.90 percent carbon tool steel which contains added carbon and vanadium in the form of vanadium carbides.

For more data circle 121 on Postpaid Card

New FEDERAL "FLYING CUTOFF" boosts output—reduces costs!



**Cuts any
length**

**Tilts to
form shapes**

**Rotates
360°**

Federal's new "Flying Cutoff" is adaptable to a variety of metalworking operations where rolling mills are used. It can double production . . . cut costs . . . help you beat competition. Air-clutch control panel synchronizes press with speed of mill—permits cutting bars, channels, angles, other shapes to any

length—continuously. Custom fabricated base provides for 360° rotation of the press. Hydraulic power permits tilting at any angle to form shapes. One-piece, machine tool grade cast iron frame, finest workmanship, and many other quality features. Up to 100-ton capacity. Write for catalog!

FEDERAL PRESS COMPANY, 904 Division Street, Elkhart, Indiana

FEDERAL *Open back* *Lockable* **PRESSES**

34 Years of Quality Construction
For more data circle 528 on Postpaid Card

CAMS

MADE TO YOUR SPECIFICATIONS

—Except Screw Machine Cams—

Design Assistance Offered

KIDDE PRECISION TOOL CORP.

15 LOCUST AVENUE ROSELAND, N. J.

For more data circle 529 on Postpaid Card

BRUSH TOP CANS For Layout Blue!



HANDY, ELLISCO BRUSH TOP CANS, MAKE IT EASIER FOR YOU TO APPLY AND STORE LAYOUT BLUE. BRUSH KEEPS MOIST IN CAN. CONTENTS WON'T DRY OUT 3 OZ. TO 1 QT. CAPACITIES. GET DETAILS AND BULLETIN.

George D. Ellis & Sons, Inc.

4024 N. American St., Philadelphia 40, Pa.

For more data circle 530 on Postpaid Card



SPELLMACO "SPOTTERS"

A matched set of transfer punches
for toolmakers, machinists and tool cribs

Used for transferring location of threaded, drilled
and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for long life—.0025 undersize to facilitate use—Black oxide finish.
SET #3-17; 28 punches with indexed stand—sizes $\frac{3}{16}$ " to $\frac{1}{2}$ ", by $\frac{1}{64}$ "—plus handy $\frac{1}{16}$ " size. Length 4 $\frac{1}{8}$ ". ONLY \$17.90.
Single sizes available

R. L. SPELLMAN CO. • URBANA, OHIO

For more data circle 531 on Postpaid Card

ETTCO-EMRICK



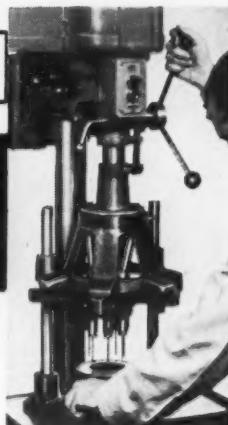
nuckle-heads

fully adjustable for dependable
multi-hole drilling and tapping

5 models to choose from —
circle or straight line types

- Chrome nickel universal ball joint type spindles.
- Adapt to any drill press or drilling or tapping unit or machine — Operate in any position.
- Quickly convertible for either drilling or tapping on any drill press.
- Lubricated ball joints with neoprene covers — an Ettco exclusive.
- Tap or drill capacities up to $\frac{5}{8}$ " in steel.
- Precision built, lightweight and compact.

Unconditionally guaranteed
for workmanship, material
and performance.



Ettco-Emrnick

Write for complete details today . . . Buy them from your Ettco Distributor

ETTCO TOOL & MACHINE CO., INC.

598 Johnson Avenue, Brooklyn 37, N. Y.

For more data circle 532 on Postpaid Card

new shop equipment . . .

SINGLE NOZZLE MIST COOLANT UNIT

Graymills Corp., 3769 N. Lincoln Ave., Chicago 13, Ill., has added a single nozzle mist coolant unit to its line of mist coolant systems. The heavy duty valve block contains a fluid metering valve and an air needle valve. The richness of the coolant can be regulated to the requirements of the job.

Graymills mist coolant systems are used on drilling, tapping, milling, sawing and tool grinding operations and for some cut-off machines. They may be used for lubricating dies on punch presses and other lubricating operations where light viscosity oils are used. Other features of the Graymills unit are the corrosion proof construction throughout, easily replaceable nozzle tips, a translucent container which reveals liquid level

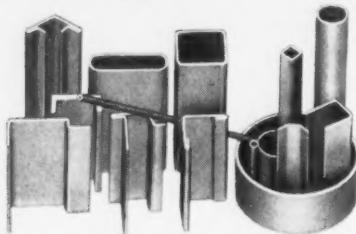


Graymills Single Nozzle Mist Coolant Unit

at all times and special nozzle design which produces a conical concentrated mist pattern for most effective cooling results.

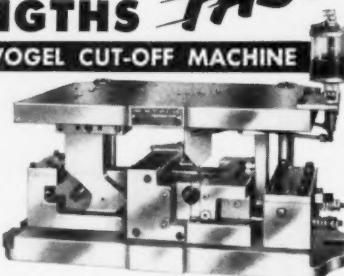
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SHEARS CLEAN TO ACCURATE LENGTHS *FAST!*



With each press stroke, unit accurately cuts off tubing and shapes into lengths of $\frac{1}{2}''$ $\pm .010''$, or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

VOGEL CUT-OFF MACHINE



No. 12 unit cuts up to $\frac{3}{4}''$ O.D. x $3/32''$ wall.

No. 2 unit cuts up to $2''$ O.D. x $\frac{1}{8}''$ wall.

No. 3 unit cuts up to $3''$ O.D. x $3/16''$ wall,
or up to $3\frac{1}{2}''$ O.D. x $\frac{1}{8}''$ wall.

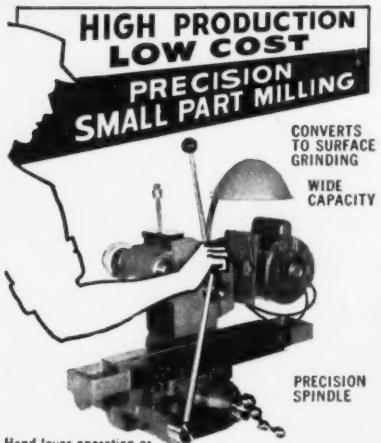
Odd shapes handled in sizes equivalent to unit's O.D. capacity.



VOGEL TOOL & DIE CORPORATION

1823 NORTH 32ND AVENUE, STONE PARK, ILLINOIS

For more data circle 533 on Postpaid Card



Hand lever operation or
calibrated feed screw
Vertical mill available

Price complete as above
\$320.00
(less motor)



Manufactured by
NORTHERN ILLINOIS MACHINISTS
Crystal Lake Rd. • McHenry, Ill.

For more data circle 534 on Postpaid Card

**Increase your
production**

BERKROY



**BOX &
PAN BRAKES**

BERKROY BRAKES are available in 24, 30, 36 inch widths. Fingers are relieved and 30, 36 inch widths are made of fabricated steel for greater strength and accuracy of bends. BERKROY also makes a *complete line of slip rolls and power hacksaws*.

Sold Thru Industrial Distributors
For illustrated brochure, write to:

BERKROY PRODUCTS CO.

1171 E. 32nd Street, Los Angeles 11, California
For more data circle 535 on Postpaid Card

September, 1959

**THE BEST
PORTABLE
ELEVATING TABLE
YOU CAN BUY...
(Eliminates Cranking)**



2000 LBS. OR *1000 LBS. CAPACITIES
*ILLUSTRATED

**A precision made
MIDWEST TABLE
Costs no more!**

- ✓ It's hydraulic . . . positions work or feeds at desired height without use of hands
- ✓ Rigid cast construction
- ✓ Top turns 360° and clamps
- ✓ Foot release valve to lower
- ✓ Machined top surface can be used as work table.
- ✓ Roller bearing casters with ball bearing swivels
- ✓ Floor clamping available extra

Write today . . . specials on request

MIDWEST
ENGINEERING COMPANY

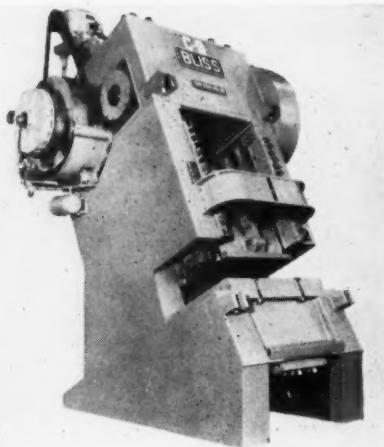
114 WEBSTER ST. • DAYTON 2, OHIO
For more data circle 536 on Postpaid Card

modern machine shop 257

new shop equipment . . .

SPECIAL 350 TON GAP PRESS

The E. W. Bliss Co., Press Division, Canton, Ohio, announces a special, permanently inclined gap frame press of 350 ton capacity. The press provides



Bliss 350 Ton Inclined Gap Frame Press

NEW FLUSH PIN AMPLIFIER

**OFFERS 5 to 1
AMPLIFICATION**



- No dial indicator needed • No master required
- Extremely rugged • Speeds up inspection • .001 to .010 tolerance range. **WRITE FOR DETAILS.**

HOLMES GAGE & DEVELOPMENT CORP.

Columbus 3, Ohio

For more data circle 537 on Postpaid Card



NOW Polish Plastic Molds — Lap Carbide, Dies & Tools — With Low Cost Tetrabor

- Tetrabor is an oil paste of boron carbide especially compounded for lapping carbide tools and dies.
- **CUT LAPING COST**—Tetrabor costs much less than diamond.
- **INCREASE PRODUCTION**—Faster acting Tetrabor permits its use in place of conventional compounds. Gives superior finish.
- Available in 100 gram tube in a wide range of grits.

Order trial kit containing 5 grams of 12 grits for \$15.50. Or send for free literature and price list.

Dealer Inquiries Invited.

TITAN TOOL SUPPLY COMPANY
1419 Hertel Avenue — Box B, Buffalo 16, New York

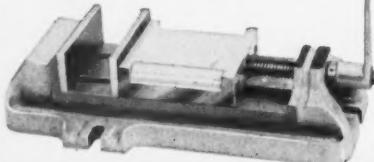
For more data circle 538 on Postpaid Card

the basic convenience of a C frame for the handling of large and awkward shaped parts, with a maximum of design features suited to the heavy duty requirements of automotive contract work.

Known as the SG1-350, it has a welded steel, tie-rod frame construction, the latest type air friction clutch and a counterbalanced slide and cushioned bed. It is designed to operate at 40 s.p.m. continuous trip and 12 single trip. A heavy cam-actuated knock-out and a motor driven slide adjustment are provided.

For more data circle 123 on Postpaid Card

HEAVY DUTY



Milling Machine Vise

Guaranteed for one year against breakage. Made from long wearing, oil resistant Mechanite casting (40,000 to 55,000 P.S.I.). Replaceable bronze nut. Coolant trough all around.

Write for folder giving complete specifications.

DUGAS MACHINE WORKS, INC.

For more data circle 539 on Postpaid Card

**620 YUMA COURT
DALLAS, TEXAS**

VERSATILE PORTABLE TENSILE TESTERS ARE DESIGNED FOR BENCH OR WALL MOUNTING

A family of portable tensile testers, for bench or wall mounting, has been developed by Steel City Testing Machines, Inc., 8823 Lyndon Ave., Detroit 38, Mich. These testers can perform standard tensile tests when mounted

horizontally and can perform either tensile or compression tests when mounted vertically.

Designated as the PT series, these testers are available in two general sizes. Model PT-20 units have capacities from 5,000 to 20,000 pounds. Details of these models are the same except that a 5,000 pound gage is graduated in 25 pound increments and



ETALON INGAGE

measures the
exact BORE or
blind hole size!

Reading: .0001"

Size 3/16" to 4"

Takes accurate measurements of blind holes. No masters or setting rings—measures directly—by .0001".

Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 6 feet deep. Hardened contact points exert minimum pressure—will not damage fragile work.

Easy to read, deep graduations on a large diameter thimble. Dull chrome plated. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.

ALINA
CORPORATION
122 East Second St.
Mineola, L. I., N. Y.

For more data circle 540 on Postpaid Card

new shop equipment . . .

a 20,000 pound gage is graduated in 100 pound increments. Model PT-40 units have capacities in excess of 20,000 up to 40,000 pounds. A 40,000 lb. gage is graduated in 200 lb. increments.



RELIANCE

Angle Dresser \$37.50 Radius Dresser \$57.00

Shipped on 10-day Money-Back Guarantee

Angle Dresser guide block is hardened and honed, push bar is hardened and ground. Radius Dresser bearing adjustment is lifetime. Both tools are finished in black wrinkle enamel. Diamond, \$7.50.

Order direct. We pay postal charges.

RELIANCE TOOL & MFG. CO.
1919 Clybourn Ave., Chicago 14, Ill.

For more data circle 541 on Postpaid Card



HAND TAPPING with MACHINE PRECISION

Adapts for LATHE USE

59⁵⁰
F. O. B. FACTORY

Just slip a tap adaptor into the Dahlstrom Tap Guide and twist. Your hand tapping will be quick and accurate. For machine tapping, the spindle top is center-bored to fit the tail stock center of a lathe. Size 18" x 8" x 14". Included 9 adaptors (8-32 to $\frac{3}{4}$ "). Taps not furnished. Write for pamphlet on Tap Guides, Chucks and Autostops.

Dahlstrom TAP GUIDE

For more data circle 542 on Postpaid Card

260 modern machine shop



Model PT-40 Portable Tensile Tester

Several sizes of flat and round jaws are available for specimens up to $\frac{1}{2}$ inch in thickness or $\frac{3}{4}$ inch in diameter. All testers have a maximum stroke of $2\frac{1}{2}$ inches, and can take 11 inch long specimens for PT-20 units and 12 inches for the PT-40. Maximum width of specimens is 2 inches.

For Model PT-20 units, tester base dimensions are 10 by 28 inches, with a height of 6 inches. For Model PT-40 units, tester base dimensions are 11 by 31 inches, with a height of 7 inches. For all models, the pump and gage unit base dimensions are 5 inches by 21 inches, with an overall height of 18 inches.

For more data circle 124 on Postpaid Card



NOW A FASTER READING DIAL CALIPER

Newly designed for faster, accurate measurement. Engraved beam graduations simplify reading. Knife jaws permit inside measurements, easy outside and depth measurements—can be locked in position. All operating components are completely enclosed. Precision built from stainless steel and brass. Two models—6" at \$39.00, 8" at \$42.00. Write Today for Free Literature. Dealer Inquiries are Invited.

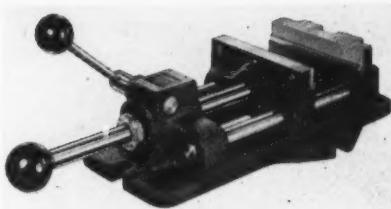
TITAN TOOL SUPPLY CO.
Box 8, 1419 Hertel Avenue Buffalo 16, N. Y.

For more data circle 543 on Postpaid Card

September, 1959

DRILL PRESS VISE AND Fixture Holder

A line of precision-built wide range drill press vises and fixture holders, that safely handle both rigid and non-rigid work without distortion, is available from L-W Chuck Co., 28 South St. Clair St., Toledo 4, Ohio. There are three sizes: 4, 6 and 8 inches. The maximum openings are 5½ inches, 6¼ inches and 8½ inches, respectively.



L-W Drill Press Vise and Fixture Holder

One of these Wilson "Rockwell" instruments will do your hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

"Rockwell" Hardness Tester—for most hardness testing functions.

"Rockwell" Superficial Tester—for extremely shallow indentations.

TwinTester—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as **CORRECT, TOO HARD, or TOO SOFT**.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brile" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.



Write for
Bulletin RT-58

WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.

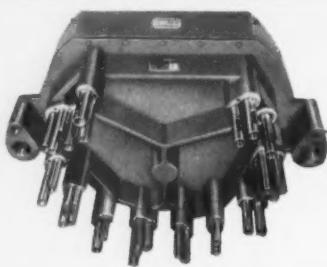
230-G Park Avenue, New York 17, New York

For more data circle 544 on Postpaid Card

September, 1959

modern machine shop 261





This
THRIFTMASTER
Fixed Center
DRILLHEAD
does 27 jobs
in 1 fast operation!

Get maximum production — use Thriftmaster designed and built Fixed Center Drillheads . . .

- Full ball bearing construction
- Fully hardened chrome-moly steel gears, spindles and drives
- All sizes, any number of spindles
- All types, including angular, rotating and lead screw
- For drilling, tapping, reaming, boring and milling
- Guaranteed performance backed by over 25 years of engineering and production experience

Also Full Ball Bearing Universal Joint, Single and Double Eccentric Adjustable Drillheads and Dorman Tappers.

Write, wire or phone for complete information today.



1034 N. PLUM STREET • LANCASTER, PENNSYLVANIA

For more data circle 545 on Postpaid Card

262 modern machine shop

new shop equipment . . .

A turn of the front adjusting screw bushing varies the jaw pressure from 1 to 1,500 pounds. Easy hand pressure on a hardened and micro-ground bar locks and holds the work. Removable jaw inserts allow quick adaptation for low cost jigs and fixtures.

For more data circle 125 on Postpaid Card

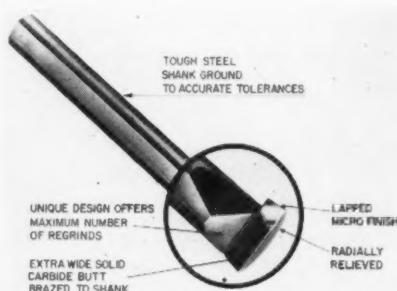
★ modern machine shop ★

CARBIDE BORING BAR FOR JIG BORERS AND LATHES

A carbide boring bar for use in jig borers and lathes is announced by Jarvis Corp., Middletown, Conn.

Called "Bor-Bar," its features include extra wide solid carbide butt brazed to shank; lapped micro finish; radially relieved; designed for maximum number of regrinds; tough steel shank ground to accurate tolerances. Bor-Bar is accurate, smooth cutting and chatter free. No special fixtures are needed for regrinding (regrind with simple vee block and diamond wheel). It is furnished relieved for either ferrous or non-ferrous materials. Stock sizes are available in the following range of sizes: minimum hole diameters, $\frac{3}{8}$ to 1 inch; shank diameters, $\frac{1}{4}$ to $\frac{3}{4}$ inch; overall lengths, 2 to 6 inches.

For more data circle 126 on Postpaid Card



Jarvis "Bor-Bar" for lathes and jig borers

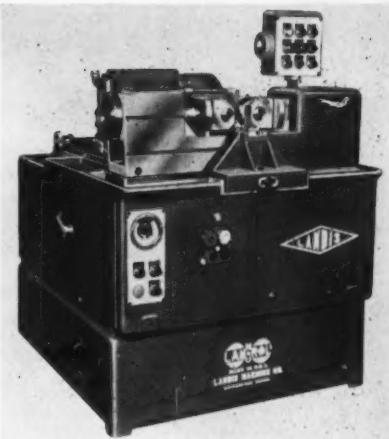
September, 1959

THREAD ROLLING MACHINE

Landis Machine Co., Waynesboro, Pa., has developed a small range thread rolling machine. Designated as the Lan-Nu-Rol, it is capable of handling diameters up to 2 inches (8 threads per inch or finer) with the "Infeed" method of rolling, and up to $\frac{3}{4}$ inch (10 threads per inch or finer) when using the "Thru-feed" method.

The machine is pneumatically or hydraulically operated and of modern design for operating and servicing ease with all major components, which require setting, conveniently located.

Spindle speeds are infinitely adjustable from 166 to 500 r.p.m. through a pulley arrangement, which requires no gear changing. The range of spindle speeds allows each diameter within the machine's range to be roll threaded at the most efficient speed. An extremely simple, highly efficient worm gear transmission is incorporated and



The Lan-Nu-Rol Thread Rolling Machine

was designed with only two gear contacts having a high overload capacity. For more data circle 127 on Postpaid Card

NUMBERALL

CUTS THE COST OF STAMPING NUMBERS

DETAIL CHASE and PUNCH
for Quick Stamping of Nameplates

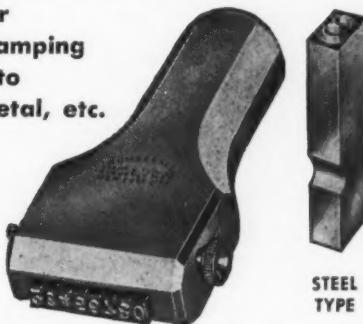


MODEL 24

An ingenious tool for rapid stamping of plain, etched or embossed nameplates. Used in a small Kick or Power Press, or in our No. 93 or No. 131 Bench Press. Steel Type and Logo Type are dropped into recess. Logo Type are used for numerical and letter combinations. All lines are stamped in one operation, making tool very efficient. Small, as well as large lots can be stamped economically, neatly. Write for Bulletin MS-24. We can also make steel type with round face characters.

IMPROVED TYPE HOLDERS

for
stamping
into
Metal, etc.



STEEL
TYPE

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . Just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: $\frac{1}{2}$ " up to $\frac{1}{2}$ " figures and letters. Write for Bulletin MS23H.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

Steel type and wheels
available with round face
characters.

For more data circle 546 on Postpaid Card

new shop equipment . . .

THROW AWAY CARBIDE TOOLHOLDER

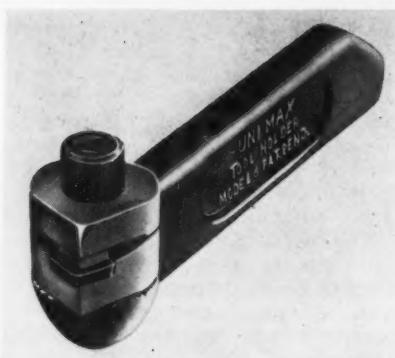
The locking insert and adjustable chipbreaker in its universal-positioning "Throwaway" carbide toolholder provides for wider use with triangular and diamond-shaped carbide inserts,

HOLES
DOES JOBS NO DRILL CAN DO
Clark "HOLE MAKER"
P. O. BOX 990 BEVERLY HILLS, CALIF.

For more data circle 547 on Postpaid Card

TAP BUSHINGS
Drives all standard taps from No. 0 to 1 1/8" and pipe taps from 1/8" to 1". Five o.d. sizes.
LESS TAP BREAKAGE
LESS TAP WEAR
Write for Bulletin
BYCO INDUSTRIES
2200 SNELLING AVE., MINNEAPOLIS, MINN.

For more data circle 548 on Postpaid Card



Maxwell Throw Away Carbide Toolholder

according to Maxwell Industries, Inc., 493 East Fifth Ave., Ashtabula, Ohio.

Combining the economy of carbide throw away inserts with the added savings of universal-positioning for all metal turning and shaping operations, the "Throwaway" toolholder eliminates the need of having several fixed-angle holders in different sizes.

The toolholder speeds up the machine operator's work by eliminating the need to change holders and by simplifying the indexing of throw away inserts. Instead of removing the holder from the machine, only the cap and locking insert are loosened, the carbide indexed and the cap and locking insert retightened. The holder remains on center of the workpiece. For more data circle 128 on Postpaid Card

*You Need an Extra Hand Now
to Speed Up Production!*

HEIMANN TRANSFER SCREW SETS

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

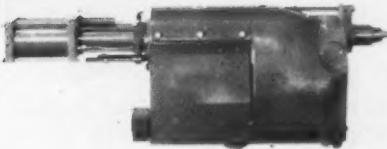
HEIMANN MFG. CO. • URBANA, OHIO

For more data circle 549 on Postpaid Card

AUTOMATIC DRILLING UNIT

The Electro-Mechano Company, 265 East Erie Street, Milwaukee 2, Wisconsin, has announced that its Model 603 Automatic Drilling Unit has been improved to incorporate a new base casting which allows for a shorter mounting dimension so that more reasonable machine bases can be used.

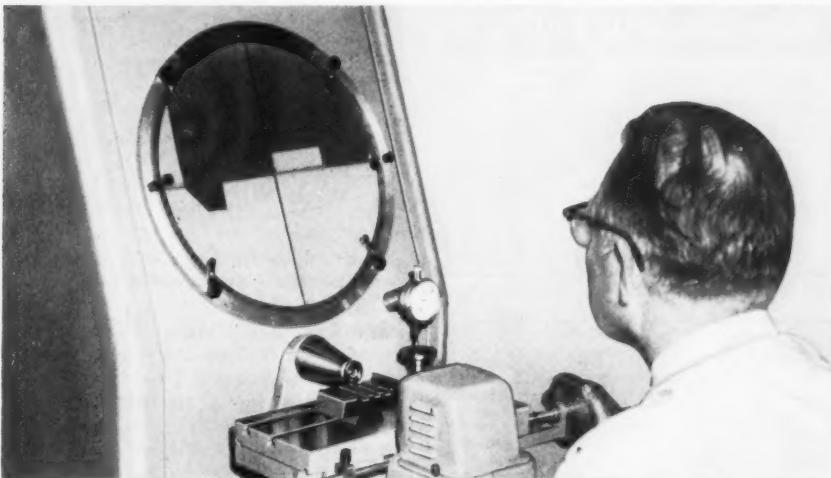
A key slot on the center line of the unit is now provided for easier setup and a NEMA Standard Motor is now



Electro-Mechano Model 603 Drilling Unit

being used in place of the special motor that was previously used on the unit.

For more data circle 129 on Postpaid Card



Quick, Economical, Precision Inspection!

Now, you can check intricate shapes such as complicated form tools in a hurry with an economical Covel Optical Comparator. It's priced at only \$985.00 to bring the advantages of precision optical inspection within the reach of every tool room and shop. With the No. 14 Comparator and a Covel Micro-Precision Grinder you've got a tool room team that can't be beat for accuracy.

Micro-Precision a Covel Tradition-Since 1874

CVEL **PRECISION**
GRINDERS
BENTON HARBOR, MICHIGAN

For more data circle 550 on Postpaid Card

Only \$985



Send for complete details on
the Covel Optical Comparator.
Ask for Bulletin M-99.

new shop equipment . . .

ALTERNATE BASES OFFER PIPING VERSATILITY FOR VALVES

Two alternate bases, offering greater piping versatility, are available for its Series "CC" four way directional air control valves, according to Hanin Co. Dept. 166, 565 South Wolf

New Ideas in Cutters

★ Designers and manufacturers of H. S. S., tantung, and carbide cutters based on cost saving principles. Form relieved, hard faced cutting edges, throwaway inserts, welded bodies, semi-finished blanks, clamped-on blades. Serving America's metal working, carbon, graphite, valve, and instrument manufacturers. Write or phone LUDlow 8400 for latest catalog.

NIAGARA CUTTER

Division of Bollier-Damerell, Inc.
332 Niagara St., N. Tonawanda, N. Y.

For more data circle 551 on Postpaid Card

**Accurate Hole Transfer Made Easy With
NIELSEN TRANSFER SCREWS**

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from $\frac{3}{16}$ " to $\frac{3}{4}$ " U.S.S. Inexpensive — Last for years.

For more data circle 552 on Postpaid Card



<divPatented

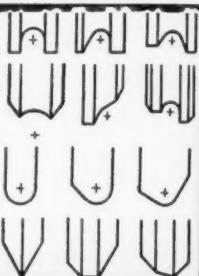
WHY WASTE TIME?

Dress Profiles like these in a few minutes without Templates or Crusher Rolls with the Jeon Automatic Angle Tangent to Radius Dresser. It's fully universal.

Write for Price and Folder.
**REPRESENTATIVES WANTED
IN SOME AREAS**

JEON MANUFACTURING CO.
P. O. BOX 6750 WASHINGTON 20, D. C.

For more data circle 553 on Postpaid Card



Two bottom ported bases offer piping versatility for **Hannifin Four Way Air Valves**.

Rd., Des Plaines, Illinois. The "Universal" valve base is normally employed when combination piping and gasket mounting is desired. All eight ports are tapped $\frac{1}{4}$ or $\frac{3}{8}$ inch pipe size and the bottom ports are also O-ring grooved for gasket mounting. Where only gasket mounting is required, the "Gasket Mounted" base is recommended. Bottom ports are O-ring grooved for mounting directly to the manifold or pad of a machine.

For more data circle 130 on Postpaid Card

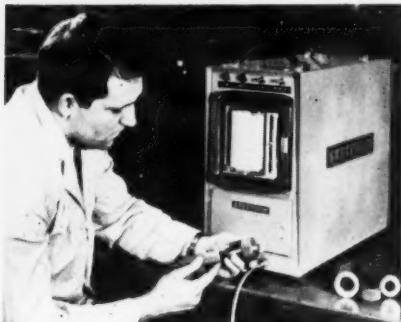
INSTRUMENT AIR GAGES AND RECORDS SIMULTANEOUSLY

Data gathering for dimensional quality control charts or a charted record to serve as a size certificate can be made fast and to machine accuracy with a gaging and recording instrument developed by The Sheffield Corp., Dayton 1, Ohio.

The instrument, which uses hand or fixture type air gage tooling, makes an automatic record showing a part's plus or minus deviation from nominal size on a 4 inch wide strip chart during gaging. The standard model is supplied with continuous chart drive and will inspect a single dimension. Where desired, the air gage recorder can be obtained also to check two dimensions.

Gage results are automatically printed on the chart in ink and they cannot be altered without detection. Also, the actual number of parts checked is revealed. The instrument is virtually tamper-proof, as all calibration controls and adjustments are behind a locked door. The scribing pen is cable connected to the pneumatic servo motor that provides the power to position the pen. The ink supply is replenished by factory sealed ink capsules. The two dimension instrument is equipped with two scribing pens.

For more data circle 131 on Postpaid Card



View of the Sheffield Air Gage Recorder

September, 1959

Specialized TOOLS

that Rate a Place
in your
Tool Crib

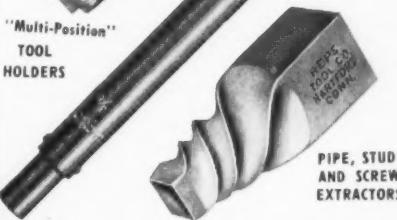
TAP
EXTRACTORS



TAP
EXTENSIONS
(2 styles)



"Multi-Position"
TOOL
HOLDERS



PIPE, STUD
AND SCREW
EXTRACTORS

The cost of Walton Specialized Tools is negligible compared with the labor and time cost that they save. A Walton Tool readily at hand is insurance against lost time. Try them at our expense in your shop . . . and rate them for a place in your tool crib.

Write for Data

Folder #10

For more data circle 554 on Postpaid Card



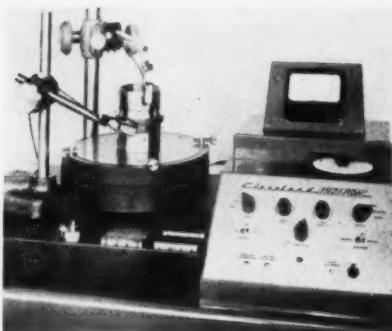
THE WALTON
COMPANY

HARTFORD 10
CONNECTICUT

new shop equipment . . .

ROUNDNESS, CONCENTRICITY AND SQUARENESS GAGE

Cleveland Instrument Co., 6220 E. Schaafer Rd., Cleveland 31, Ohio, announces the Indi-Ron, an instrument specifically designed for ultra-precision out-of-round, concentricity and squareness measurements. A controlled temperature room is not necessary for proper operation of the instrument. As a result, it is said to be possible to make the following measurements



Set-up view of Cleveland Indi-Ron Roundness, Concentricity and Squareness Gage

END MILLS

SHARPENED

60c PER END up to an including $\frac{1}{2}$ " dia. 20c each $\frac{1}{8}$ " over $\frac{1}{2}$ ". Send us your worn, dull or chipped end mills for like-new sharpening. We also sharpen and recondition Milling cutters, Woodruff Keyseat, and other cutting tools. Satisfaction guaranteed.

Supreme Keyseat Cutters Co.
1328 43rd St. OL 4-8800 Kenosha, Wis.
Manufacturer of Woodruff Keyseat Cutters

For more data circle 556 on Postpaid Card

B-R-E-A-K . . . Hand Finishing Bottlenecks with Portable Electric Reciprocating Tools



These handy tools will cut out many tedious hand filing and finishing operations—Increase Production—Produce Uniform Work.

Light in weight—Delivers $\frac{1}{8}$ " or $\frac{3}{8}$ " fixed stroke at 1000 strokes per minute—Operates on 110 volts AC or DC.

ACME TOOL CORP.

73 WEST BROADWAY NEW YORK 7, N. Y.

For more data circle 555 on Postpaid Card

268 modern machine shop

to an accuracy of three (3) millionths or less in a few minutes: roundness—any inside or outside diameter; concentricity—any I.D. or O.D. to any other I.D. or O.D. or any axis; alignment—any axis to any other axis; squareness—any face or flange or any other face or flange or any axis; and flatness—of any face or flange.

The instrument can be used in the lab for analysis, in inspection for quality control, and in production for accurate set-up. Standard turntable capacity on the Indi-Ron is 6 inches and weight load, maximum 75 pounds. Normal spindle speed is 4 r.p.m. The Cleveland Indi-Ron is also available with turntable capacities to 18 inch O.D. and several hundred pounds in weight, and spindle speeds from less than 1 r.p.m. to 35 r.p.m.

For more data circle 132 on Postpaid Card

READING BENCH KEYSEATER

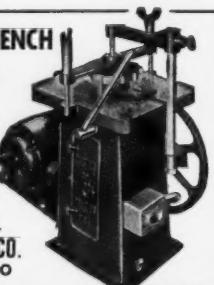
Portable — move directly to job; a time saver for both small and large shops.

$3\frac{1}{4}$ " stroke; adaptable for other work.

Low first cost — prompt delivery.

Good dealers wanted.

READING MACHINE CO.
CINCINNATI 37, OHIO



For more data circle 557 on Postpaid Card

September, 1959

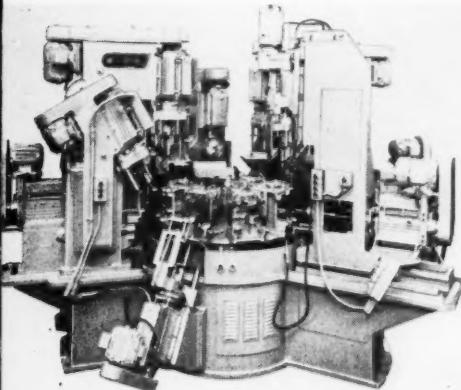
SPECIAL EIGHT STATION MACHINE PERFORMS 19 OPERATIONS

Wisconsin Drill Head Co., 4983 North 124th St., Butler, Wisconsin, announces a special eight station machine that performs 19 separate operations on forged steel connecting rods for outboard motors. A series of four duplicate machines, all having interchangeable tooling, enables the manufacturer to process 10, 18, 25, 35 and 50 h.p. connecting rods. A-B type fixturing permits both sides and both ends of the connecting rod to be machined simultaneously. Work-holding fixtures are clamped and unclamped automatically.

Complete fixture dial plates with the eight holding fixtures are quickly interchangeable. Bushing plates are also designed for quick removal, and the utilization of standard adjustable drill heads with quick-change spindle positioning plates allow these machines to be changed over from one size connecting rod to another in less than four hours.

The machine is designed to operate on a 25 second cycle, producing 144 parts per hour.

For more data circle 133 on Postpaid Card



Wisconsin Special Eight Station Machine

September, 1959

VAPOR BLAST

Liquid Honing*

MACHINES PRODUCE DECORATIVE FINISHES QUICKER, CHEAPER AND BETTER ON

- Eye Glass Frames
- Camera Parts
- Machine Tool Dials
- Watch Bands
- Watch Cases
- Sewing Machine Parts
- Stainless Steel Pipe
- Plastic Parts
- Orthopedic Equipment
- Architectural Aluminum
- Cutting Torches



Vapor Blast is a trademark.

Liquid Honing is a trademark.

"WORLD'S LARGEST
MANUFACTURER OF
WET BLAST
EQUIPMENT"

VAPOR BLAST
MFG. CO.
3013A West Atkinson Ave.
Milwaukee 9, Wisconsin
For more data circle 558 on Postpaid Card



modern machine shop 269

new shop equipment . . .

8-TON POWER PUNCH PRESS

Alva Allen Industries, Dept. MM, Clinton, Missouri, announces the Allen Model BT-8 8-Ton Punch Press which can be easily set up for any standard punch press operation, such as blanking, forming, shearing, rivet-



DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmersding, Pa.

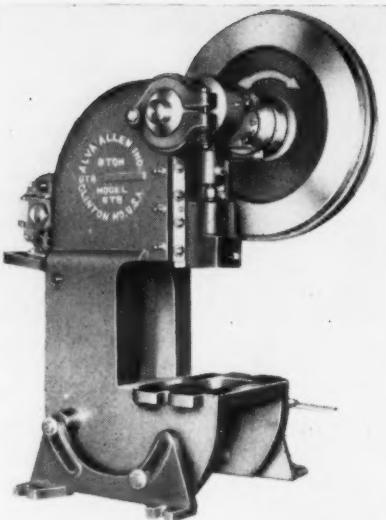
For more data circle 559 on Postpaid Card



**Guide Pins
and Bushings**
Hardened and ground.
Standard and special machined parts.
Write for folder!

Bard Mfg. Co.
ROYERSFORD • PA.

For more data circle 560 on Postpaid Card



Allen Model BT-8 Eight Ton Punch Press

ing, drawing, cutting, punching, crimping, and so on, in such materials as metal, fiber, paper and plastics. Available in either a bench model or floor model the BT-8 is equipped with the Allen reliable single pin, knife type clutch and can be easily changed from repeat (continuous) to non-repeat (single stroke) action. Adjustable V-type ram gibs and easily adjustable ram for die setting are other features of this new model.

For more data circle 134 on Postpaid Card



Air-O-cheek
The Nozzle Valve with the internal fulcrum lever
Available in two models and many sizes

AIR ECONOMY
SAVE through superior performance, low maintenance, low initial cost. Air-O-cheek air guns are of simple design, sturdy construction, and are easy to use.
Write for details

AIR-WAY PUMP & EQUIPMENT CO.
1046 N. Kilbourn Ave., Chicago 51, Ill.

For more data circle 561 on Postpaid Card

IMPREGNATOR APPLIES CARBIDE TIPS

The OK Tool Co., Inc., Milford, N. H., announces the Wickman Impregnator. This unit applies either a coarse or fine layer of specially formulated carbide to the cutting surface of high speed steel tools, increasing life of the tools.

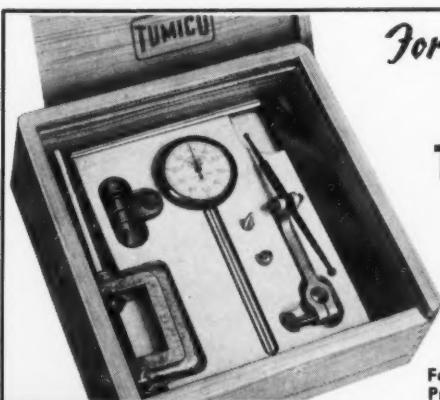
A localized sparking action transfers the carbide from the applicator tip to the cutting tool surface to increase wear resistance. This action literally causes the carbide to penetrate the metal of the tool and builds up a layer of approximately 0.003 inch when a coarse setting is selected and approximately 0.0005 inch on a fine setting.

Typical examples of increased tool life after treatment with carbide by the Wickman Impregnator are: drills, taps, single point turning tools, press tools, stress sections of large dies, extrusion dies, forging dies, woodwork-



Wickman Impregnator is a portable unit

ing, routing cutters, planer blades, masons' chisels, tin shears, milling cutters, end mills and many others. For more data circle 135 on Postpaid Card



SCHERR TUMICO

PRECISION MEASURING
TOOLS AND INSTRUMENTS

*For Precision
and Reliability*

Tumico "SUPER-SET" UNIVERSAL PRECISION DIAL TEST INDICATOR SET

Complete Set
Now Only

\$21.50

For the Complete Story of this Outstanding
Precision Tool — Contact any of our 3
"Coast to Coast" Locations or your nearest
Local Distributor.

Eastern Office: **GEORGE SCHERR CO., INC.**
200 Lafayette Street • New York 12, N. Y.

Midwest Office and Factory: **TUBULAR MICROMETER CO.**
St. James, Minnesota

West Coast Office: **SCHERR-TUMICO CO.**
3337-39 West Olympic Blvd. • Los Angeles 19, Cal.

For more data circle 562 on Postpaid Card

HOLES

WITH PRECISION ADJUSTMENT
M-3 H.S.S. OR CARBIDE



Clark

"FINISHING CUTTERS"

P. O. BOX 990 BEVERLY HILLS, CALIFORNIA

For more data circle 563 on Postpaid Card

THE SCHWIETERMAN CENTER FINDER

Inside and outside diameters are located with machine spindle running, duplicating exact machining conditions. For jig borers, vertical & horizontal mills, lathes, drill presses, etc. From 82.00



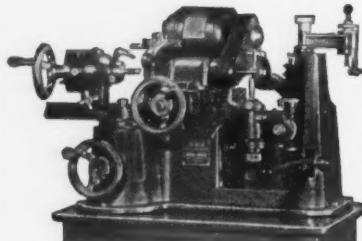
PRECISION GAGE & TOOL COMPANY

320 E. Third St., Dayton 2, Ohio, USA

For more data circle 564 on Postpaid Card

HYBCO TAP GRINDER

Sharpens Chamfers, Flutes
and Spiral Points



MODEL 1100

- Capacities No. 0 Machine Screw to 2 1/2" Hand Taps.

HENRY P. BOGGIS & CO.
708 E. 163rd St., Cleveland 10, Ohio

For more data circle 565 on Postpaid Card

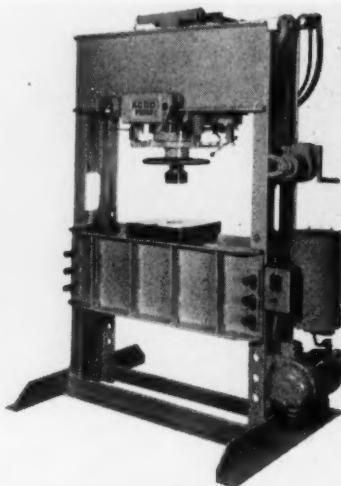
new shop equipment . . .

150 TON ELECTRIC HYDRAULIC PRESS

Engineered to handle heavy duty jobs requiring pressures up to 150 tons, a motorized hydraulic press has the ability to withstand rough treatment and abuse. Designed to meet exacting and general pressroom work needs of industry in maintenance shops, rolling mills, railroad repair depots, factories and machine shops, this unit — the 150 Ton Electric Hydraulic Press—is introduced by ACCO Equipment Division, American Chain & Cable Co., Inc., York, Pa.

This electric hydraulic press is available in two models for different operating characteristics. The Model MPH-150-E22 is equipped with a 2 h.p. motor and has a ram speed at no load of 4.2 i.p.m. and 2 i.p.m. at full load. The Model MPH-150-E55 is equipped with a 5 h.p. motor and has a ram speed at no load of 11 i.p.m. and 7.5 at full load.

For more data circle 136 on Postpaid Card



ACCO 150 Ton Electric Hydraulic Press

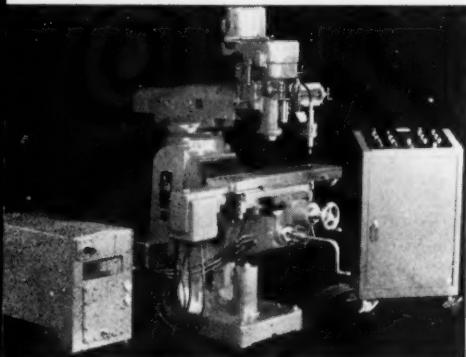
THREE DIMENSIONAL DUPLICATOR

George Gorton Machine Co., 1706 Racine St., Racine, Wis., announces its "Auto-Trace" Electro-Hydraulic 180 Degree Duplicator. This automated machine incorporates many novel features for milling convex and concave shapes at high feed rates and to close tolerances. It can also be operated as a conventional power or hand feed miller, utilizing the full length of table and saddle screws.

Electro-hydraulic tracing has these features: machine is not paced by operator; accuracy is not subject to human error; it eliminates rejects and scrap; cuts hand finishing time to a minimum; requires little attention from operator—only occasional cutter inspection; with increment cross feed, this machine does three dimensional jobs automatically.

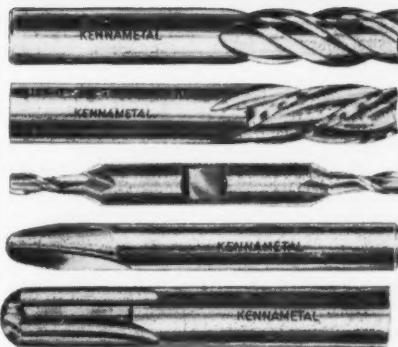
This Gorton development combines electro-hydraulic tracer control with standard Gorton Milling Machines for continuous scanning in three dimensions—all automatic within the cutter cycle. These are completely integrated units, built up at the factory. Instant responsive electronic tracing is combined with the smooth power of hydraulic feeds.

For more data circle 137 on Postpaid Card



"Auto-Trace" Electro-Hydraulic Duplicator

September, 1959



NOW... A COMPLETE LINE OF SOLID KENNAMETAL END MILLS

Stocked for immediate delivery

Now, Kennametal Inc. offers you a complete line of solid, precision-ground end mills of the same consistently high quality tungsten carbide used for years in other types of Kennametal cutting edges for the metalworking industry.

For every job requirement. Stocked in fifteen different styles, new Kennametal End Mills are available in diameters from $\frac{1}{16}$ " to $\frac{3}{4}$ " . . . a size and style to match your milling requirements.

For better finish. Kennametal has an extremely high YME . . . up to 94 million psi . . . three times that of hardest steel. High hardness, plus one-piece construction, provides maximum rigidity for smooth, even finish to meet high precision requirements.

For longer life. Kennametal End Mills are all-carbide . . . eliminate brazing failure, and provide maximum resistance to heat and abrasion.

New 12-page Catalog now available. Ask your Kennametal Representative or write Kennametal Inc., Latrobe, Pa.

*TRADEMARK

97233



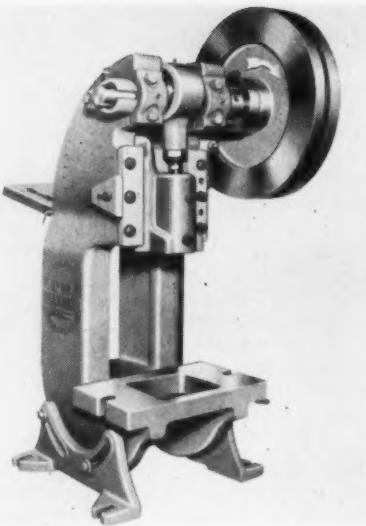
For more data circle 566 on Postpaid Card

modern machine shop 273

new shop equipment . . .

IMPROVED STANDARD ECONOMY PRESS

Benchmaster Mfg. Co., Box 1310, Gardena, Calif., announces its Series 40 Standard O.B.I. Press which develops 5 full tons, yet is designed to meet economy requirements. Standard stroke is 1 inch with a $7\frac{1}{2}$ inch shut



Benchmaster 5 Ton Series 40 O.B.I. Press

UNEQUALLED

For Small Jig Boring Jobs!

LINLEY JIG BORER



Made for small precision work found in all sized shops. Meets your most exacting requirements; releases large capacity borers for heavier jobs. Investigate the savings made possible with the Linley Jig Borer. An inquiry card mailed today will bring you detailed information promptly.

Table Size: 7" x 17 $\frac{1}{2}$ "

Table Travel: 6 $\frac{1}{2}$ " x 10"

LINLEY BROTHERS CO.

661 State St. Ext., Bridgeport 1, Conn.

For more data circle 567 on Postpaid Card

height, but $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 inch strokes are available. The ram has a 1 inch adjustment and is equipped with a 1 inch hole for tooling. Center of slide to frame measures 4 inches with a bed area of $6\frac{1}{4}$ by 10 inches.

The positive single trip clutch mechanism is retained. Ram can be made to run continuously by removing one bolt. Gibs on slide are adjustable and play in slide can be removed with a single take-up bolt. An adjustable brake on the crankshaft is included. For more data circle 138 on Postpaid Card



SAVE 50% of positioning time

With one set-up on a Cincinnati Gilbert universal table, you can drill at any angle up to 90° on 5 sides of a cube. Provides maximum support of work piece, assures rigidity and accuracy. Table sizes: 22" and 27" square, 22" high. For complete details and specs, ask for Bulletin 850.



THE CINCINNATI GILBERT MACHINE TOOL COMPANY • CINCINNATI 23, OHIO

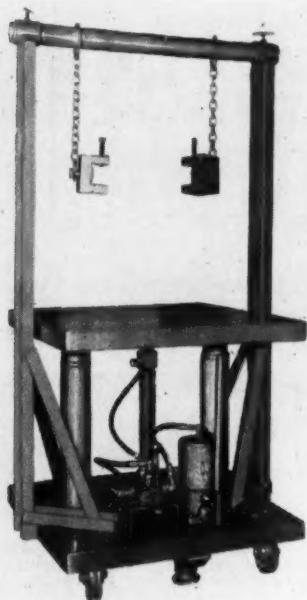
For more data circle 568 on Postpaid Card

PUSH-PULL DIE HANDLER

Lexco Eng. & Mfg. Corp., 20 West Chestnut St., Souderton, Pa., announces its two-way hydraulic table type push-pull die handler.

Table size is 30 by 30 inches and capacity is 2,000 pounds. It can handle up to a 20 inch wide die between clamps. Clamps are moveable on bar for various size dies. It has 14 inches of clearance to the bottom of the bar with the table in top position. The table operates from 30 inches low to 48 high; two-way feature makes it easy to assemble and separate dies.

The die handler is of heavy duty, all steel construction and is mounted on two 5 inch rigid casters and two 5 inch swivel casters. Casters have roll bearings in the axles and ball bearing swivels, and the wheels are all steel for easy rolling over shop floors. For more data circle 139 on Postpaid Card



Lexco Hydraulic Push-Pull Die Handler

September, 1959

Another

VICTOR VALUE

Top Quality
Lowest Prices

Our Special Import . . .

DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
1/4	\$ 6.00	\$ 2.85
1/2	12.00	5.00
3/4	21.00	7.50
1	30.00	10.25
1 1/2	54.00	15.00
2	75.00	20.00
2 1/2	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

Order today—Immediate
Shipment From Stock!

VICTOR

MACHINERY EXCHANGE, INC.
Dealers in Tool Room Equipment

Dept. B, 251 Centre St.

Tel.: CANal 6-5575, New York 13, N. Y.

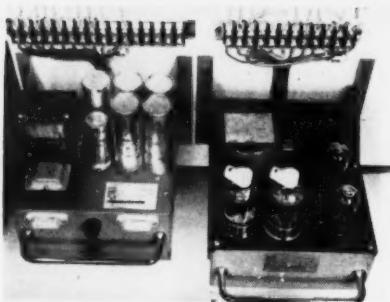
For more data circle 569 on Postpaid Card

modern machine shop 275

new shop equipment . . .

ELECTRONIC SERVO AMPLIFIER AND POWER SUPPLY

A newly designed electronic servo amplifier and power supply, useful for designers of instrument servo systems, is available from Seneca Falls Machine Co., Electronic Division, 19 Fyfe Bldg., Seneca Falls, New York. The



Electronic Servo Amplifier and Power Supply

units will control a wide range of a.c. servo motors with mechanical power outputs up to 10 watts.

The electronic amplifier will accept low level a.c. signals from a variety of existing transducers and from an a.c. feedback tachometer. The output power from the amplifier is available at various impedance levels via a combined matching and isolation transformer. High sensitivity and stability of the electronic amplifier is achieved by using electronic feedback techniques and long-life electronic tubes.

The power supply converts an a.c. input voltage to the filament and d.c. voltages needed to operate the electronic amplifier. It also provides excitation voltage for external signal displacement transducers, when they are used as a signal source.

For more data circle 570 on Postpaid Card

CAM MILLING
JIG BORING

A SPECIALIZED CAM MILLING SERVICE,
JIG BORING
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Twisted or broken tangs replaced at low costs on any tool with a Morse Taper (sizes 1 to 6). Hundreds of leading industries save money on drills, reamers, countersinks, cutters, drivers, the NU-TANG way. Prompt delivery. Send for prices—send tools for repair. All work guaranteed.

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Send them to us like this! GUARANTEED STRONG AS NEW! We return them like this!

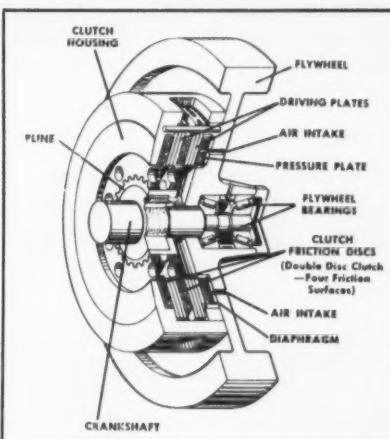
• Patent No. 2,522,011
NU-TANGS INC. 1339 Bates Avenue
Cincinnati 25, Ohio

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AIR CLUTCH FOR INCLINABLE PRESSES

The Federal Press Co., 604 Division St., Elkhart, Ind., has introduced a self-adjusting disc type, low inertia air clutch that operates on controlled air pressure and uniformly engages a full 360 degrees of friction surface. The clutch is said to deliver the full torque at all times. It assures high-speed, shock-free action, less noise, with low air consumption.

A dual air solenoid valve, regulated by two interlocking control circuits, actuates the clutch through air intakes located in the flywheel. When the clutch is engaged, instant and total contact of the driving disc and friction disc is established with a minimum amount of movement. The flywheel mounting reduces the mass to be put into motion when the press is cycled, and the lack of any overlapping drag in the brake assures fast



Federal Air Clutch for inclinable presses
action in engaging and disengaging at any speed.

Two hand-operated or foot controls provide single cycle, continuous, inch-

FAST, CLEAN, ECONOMICAL HEAT

Provides high, fast heat for metal bending, metal forging, occasional heat treating, metal forming and preheating. Clean, efficient, equipped with four burners. Two end burners have separate shutoff valves, may be turned off for smaller jobs. Operates economically on any type of gas. Convenient gas-air adjustment panel. Adjustable swinging refractory lid. Adjustable front rack to support long pieces and hold tools. Solenoid safety valve turns gas off automatically when blowers are turned off. High temperature, insulated firebox, $5\frac{1}{2}$ " by $7\frac{1}{2}$ " by 27". Maximum 425,000 BTU input. F.O.B. Factory \$246.00.

johnson
If it burns gas, look to Johnson
Since 1901

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September, 1959



modern machine shop 277

new shop equipment . . .

ing, emergency stop and top stop operation. The clutch is available on all Federal o.b.i. presses.

For more data circle 141 on Postpaid Card

★ modern machine shop ★

PUNCH PRESS CLUTCH OFFERS SAFETY AND QUIET OPERATION

Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22, has

recently developed a "Cyclo-Safe" Roller Clutch, which employs a positive locking pawl, thereby preventing any possibility of double tripping of the clutch.

Operating characteristics and advantages are as follows: long operating life—in prolonged runs under severe operating conditions, examinations of Cyclo-Safe Roller Clutches have shown no appreciable wear; fail proof—it is claimed to be impossible for the Cyclo-Safe Clutch to double trip as a result of clutch malfunctioning.

A positive locking pawl is claimed to prevent any possibility of double tripping or malfunctioning of roller engagement; quiet operating — when tripped, the clutch is practically noiseless; permits precise timing — when single stroking, there is no variation in delay between initiating the stroke and the actual clutch engagement.

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NEVER SATISFIED UNTIL
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economy, quality—let's hear from you...
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**ADAMAS CARBIDE
CORPORATION**

KENILWORTH, NEW JERSEY

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278 modern machine shop



**Kenco "Cyclo-Safe"
Roller Clutch
features safety and
quiet operation**

September, 1959

HYDRAULICALLY OPERATED SHEARS

A line of metal-cutting shears that make use of hydraulic power has been developed by the Steelweld Machinery Division of The Cleveland Crane and Engineering Co., Wickliffe, Ohio. The blade of each shear is powered by a single hydraulic cylinder. The blade is pivoted and turns in a curved path. The single cylinder applies constant force throughout the cutting action by means of a cross shaft that links the piston rod to the two ends of the blade.

An outstanding feature of Steelweld Shears is the ease with which the knife clearance can be adjusted to suit different plate thicknesses. This can be done in a few seconds by turning a hand crank conveniently located at the front of the machine. It permits shearing with exactly the right clearance for every plate size. Sharp, straight, accurate cuts are obtained with minimum burr and knives stay sharp longer.

A cutting stroke adjustment is provided that enables changing the upper and lower limits of the blade

travel to suit the work. The operator can quickly set the shear for short-stroke operation, thereby providing more rapid cycling when cutting narrow stock. Then the knives will cross for only a fraction of their length, just enough to shear the stock.

Among other features are the heavy rigid steel frame, deep 24-inch throat, quiet hydraulic hold-downs, portable fatigue-reducing electric foot switch, smooth operating back gauge, conveni-

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MODERN MACHINE SHOP

cincinnati 2, ohio

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MALLEABLE MACHINE HANDLES



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MUSKEGON HEIGHTS, MICHIGAN

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SPECIFY Dependable GRAYMILLS COOLANT PUMPS

for Replacement and
Original Equipment

Here is a pump that complements the finest machines—rugged, dependable, abrasive proof. Obvious quality...priced right too. 50 standard models. Sold by Industrial Distributors.

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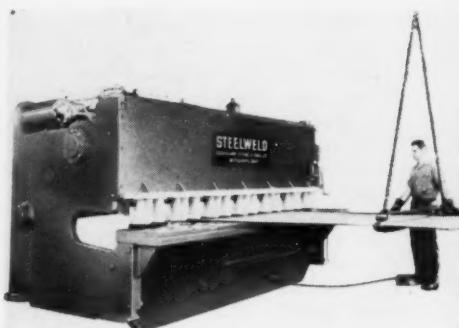
Graymills Corp.
3769 N. Lincoln Ave.
Chicago 13, Ill.

For more data circle 578 on Postpaid Card



280 modern machine shop

new shop equipment . . .



Steelweld Pivoted-Blade Hydraulic Shear

ent one-man knife adjustments and low fixed rake angle. "Safety stroke," "single stroke repeat" and "single stroke non-repeat" control cycles are available merely by turning a selector switch.

Steelweld Hydraulic Shears are available in a complete range of sizes for cutting plate lengths to 30 feet and for all thicknesses from light gauge to 2 inches.

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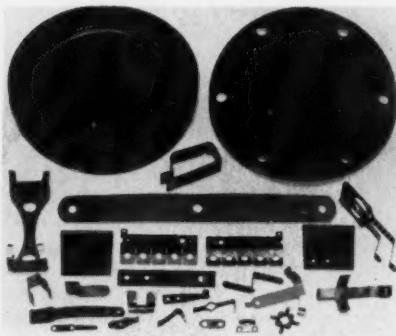
★ modern machine shop ★

PHOSPHOROUS BRONZE STAMPINGS

Phosphorous bronze stampings for clips, springs, diaphragms, leads and so on, are now being produced by Federal Tool and Manufacturing Co., 3615 Alabama Ave., Minneapolis 16, Minn. The accompanying illustration shows a number of phosphorous bronze stampings which have been held to close tolerances, some as close as plus or minus 0.002 or 0.003 inch and concentricity in circular parts within plus or minus 0.003 to 0.005 inch.

Phosphorous bronze can be rolled to the temper desired by user and

September, 1959



Federal phosphorous bronze stampings

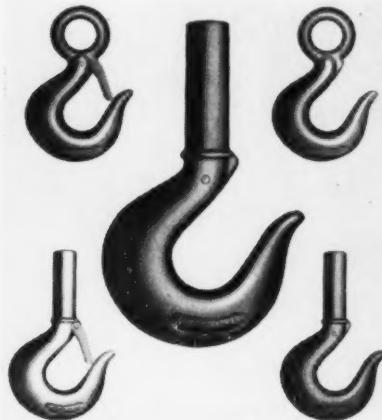
purchased in thickness required. The material work hardens as it is formed or drawn.

For more data circle 144 on Postpaid Card

★ modern machine shop ★

DROP FORGED, ALLOY STEEL HOIST HOOKS

J. H. Williams and Co., 412 Vulcan St., Buffalo 7, N. Y., announces a new series of alloy steel hoist hooks that it claims will offer 25 percent greater



Drop Forged, Alloy Steel Hoist Hooks

September, 1959

Hammond
OF KALAMAZOO

**2 IN 1
NO-DUST
GRINDER**

SAVE OVER 50% FLOOR SPACE
THE HAMMOND WAY



DUST-LADEN AIR IS A MENACE!

- Protect your employees' health.
- Protect nearby machine tools from dust and grit.
- Save floor space — requires only 6½ square feet.
- Features 10", 12", and 14" wheels.
- Write for Catalog.

Hammond Machinery Builders
1616 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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ACCURACY is an ECONOMY!
and only precision offers you
HIGHEST QUALITY!

now is the
time
to put your
OLD STEEL
PARALLELS to "LIKE NEW"
conditions and to be ready for the big push.

For the first time Anton Machine Works offers to regrind your old parallels to the following tolerances:

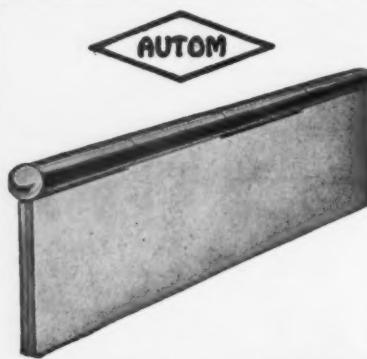
- Parallelism and straightness over length of 6" $\pm .0001$
- Size tolerance between a pair $\pm .00005$. A complete list of new parallels in stock will be mailed on request.

ANTON MACHINE WORKS

1226 FLUSHING AVE., BROOKLYN 37, N. Y.

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modern machine shop 281



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**WILSON
AIR
COLLET
CLOSER**



STEP UP PRODUCTION 20% +

... for most lathes to 1" bar stock capacity

- Hold delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

WILSON AIR COLLET CLOSER, INC.

909 40th Ave. NE, Minneapolis 21, Minn.

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new shop equipment . . .

load capacities over carbon steel hooks of the same size. This is an advantage to those desiring extra capacity without increasing size or weight.

The load capacity differential will also permit the use of alloy hooks one size smaller than corresponding carbon steel hooks and still retain equal or greater capacity.

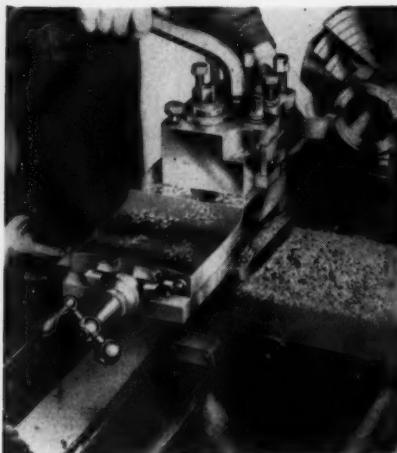
Size for size, Williams carbon and alloy steel hooks have identical physical dimensions in the safety and regular, eye or shank patterns. Capacities range from $\frac{3}{4}$ to $68\frac{1}{4}$ tons safe working load, using a safety factor of four. For more data circle 145 on Postpaid Card

★ modern machine shop ★

UNIVERSAL TOOLHOLDER

Homestrand, Inc., 9 Addison St., Larchmont, N. Y., announces the Malcus universal toolholder for lathes with 16 inch swing or larger.

Great rigidity and accuracy are obtained by locking the toolholders against the body of the tool post. A



Malcus Universal Toolholder for lathes

large variety of toolholders and boring bars are available, as well as a grinding attachment.

For more data circle 146 on Postpaid Card

★ modern machine shop ★

MOTORIZED ROTARY GRINDING TABLE AND COMBINATION INDEX FIXTURE

M & M Tool & Mfg. Co., 1123 East Third St., Dayton 2, Ohio, announces its Model 710-V Index, which was especially designed to provide a power rotary table for surface grinders and, also, to be used as an index table, hand operated to give a combination index 2, 3, 4, 6, 8, 12 and 24 for jig grinder holes, drilling or grinding equally spaced holes.

The model shown in the illustration can be used in inspection, as well as production. Parts can be quickly drilled without fixturing or drill jigs. Index



Shown above is the M&M Model 710-V Index

on 10 inch circle is held to 0.0003 on 24 sections.

The table is powered by an electric motor which features variable speed control.

Forward-reverse switch clutch is provided for hand operation and indexing.

For more data circle 147 on Postpaid Card

HIGH SPEED PRODUCTION CONTINUOUS OIL GROOVING

WICACO CONTINUOUS OIL GROOVER cuts grooves of all descriptions, internal or external, continuous or intermittent.

Send us samples for grooving. We will return them cut to specifications, with a record of time and cost estimate. No obligation.

*Ask For Descriptive Booklet And See
How You Can Improve Your Production.*

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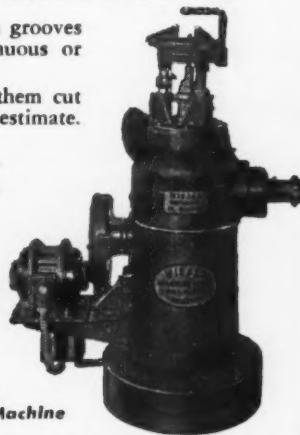
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WAYNE JUNCTION, PHILA. 44, PA.

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Continental Drill Corp., 555 W. Adams Street
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Send us FREE handy-form permanent charts
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Conversion Factors Drill Grinding Data
 Cutting Speeds and Tap Drill Sizes, Dec.
 Feeds Equiv.

Co. Name _____

Address _____

City _____ State _____

Attention: _____

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284 modern machine shop

new shop equipment . . .

**INSTRUMENT OFFERS
OPTIMUM AMOUNT OF
NOISE PROTECTION**

"Quiet-Ear," a unique new ear protector announced by Bausch & Lomb Optical Co., 893 St. Paul St., Rochester 2, N. Y., was developed to meet the need of personnel who work near loud noises.

It uses neither bulky absorbing materials, nor excessively large sealing shells. Applicable anywhere where noise becomes a hindrance or a nuisance, this lightweight, sanitary and inexpensive ear protector offers optimum noise protection.

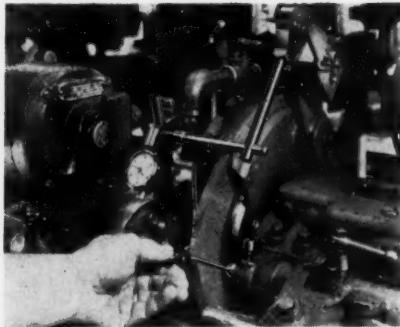
It can be effectively used in a wide variety of operations: jet airfields and carrier flight decks, diesel engine generator houses, bio-acoustic testing laboratories, artillery or missile launching sites, steel rolling mills, punch press machinery, rock drilling, riveting and many others.

For more data circle 148 on Postpaid Card



Bausch and Lomb "Quiet-Ear" Protector

September, 1959



The gaging contacts of the small size Arnold Grinding Gage are retracted by means of a finger grip in order to permit placing the calipers on the work without damaging either the workpiece or the gage contacts.

MINIATURE GRINDING GAGES

A small size continuous grinding gage (Model SG) is announced by Federal Products Corp., 9147 Eddy St., Providence 1, Rhode Island.

The calipers regularly furnished with the miniature gage are adjustable from 0.093 to 0.500 inch. Calipers as small as 0.060 inch can be furnished for some applications. Because workpieces in this size range are less rigid and more susceptible to flexing than larger parts, these smaller, lightweight gages are designed so that they will not exert forces that might distort the work.

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- PIERCING PUNCHES
- BUTTON DIES
- STANDARDS • SPECIALS

Also send Blue Prints for Estimates on screw machine products and centerless grinding.

PEMCO PERFORATORS CO.

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PORTER MACHINE CO.
CINCINNATI 9 OHIO
30 YRS. SERVING INDUSTRY

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September, 1959

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Spring Loaded LIVE CENTERS

CHECK THESE OUTSTANDING FEATURES:

- Automatically operated take-up for work expansion.
- Minimum overhang. Reduces vibration.
- High radial and thrust load rating.
- Easily accessible for lubrication with any spindle oil.
- All working parts hardened and ground
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and

Counterbores

Selections by the THOUSANDS

STYLES • DIMENSIONS

RANGES • SELECTABILITY

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WHY BUY SPECIALS?

Send for this catalog NOW!

TWENTIETH CENTURY MFG. CO.

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modern machine shop 285

PRICE + SERVICE = COST

As with any item, both factors must be considered in purchasing

Punches & Dies

SO the LEWTHWAITE CATALOG SHEETS list our large, planned stocks of interchangeable and exceptionally long wearing punches and dies—with prices—

AND include charts and instructions for figuring correct clearance allowances for both type and thickness of metal being punched—so that the best tools are used under the best conditions—

THEN leave it up to you to buy—try—and decide.

WHEN you do, we think you will join the ever-growing list of **T. H. LEWTHWAITE MACHINE CO.** customers.

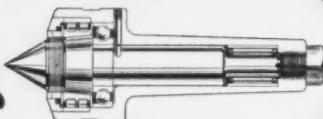
Send for catalog sheets on our complete line today.

317 East 47th St., New York 17, New York

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NIELSEN

Heavy Duty Live Centers



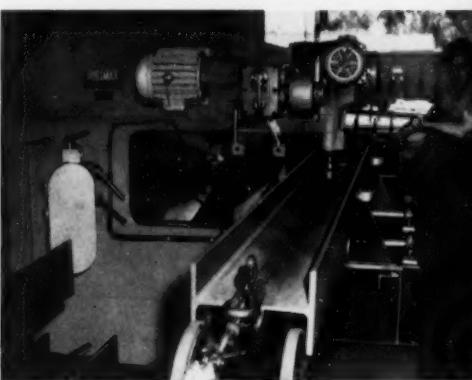
Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

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M on live centers

NIELSEN, INC. LAWTON, MICHIGAN

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new shop equipment . . .



Pullmax U-10 I Beam Splitting Machine

I BEAM SPLITTING MACHINE

A specially built machine for I beam splitting is offered by American Pullmax Co., Inc., 2465 North Sheffield Ave., Chicago 14, Ill. This heavy duty machine is known as the Pullmax U-10.

It has a new automatic mechanism operated by pushbutton control for starting, penetrating and cutting of heavy metals. The Pullmax U-10 now takes the manual labor out of this difficult operation.

In regular operation, the I beam can be pulled through the machine at the rate of 10 to 20 f.p.m. The Pullmax U-10 will leave a smooth, finished edge

SUPERIOR® INDICATOR

A Low-Priced Dial Type Indicator Has 2 contacts $1/32''$ threaded within $1/8''$. Double Faced. Reads front and back. Two Crystals. Double faced dial indicator complete with plated holder including $1/32''$ and $1/8''$ contacts — Superior Indicator ± 50 . . . \$8.95 Superior Indicator $\pm 75X$ with Universal Swivel . . . \$10.95

Thousands of satisfied customers!
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P. O. Box 734, Rochester 3, N. Y.



Patented

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without any distortion of the I beam. This machine can also be used for circle cutting, straight shearing and all other standard Pullmax cutting and forming operations.

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TENSION BUSHES

The John Gillen Co., 2542 S. 50th Ave., Cicero 50, Ill., has introduced a new product called a Tension Bush which is particularly suited for oscillating or low r.p.m. bearing applications where there is considerable wear and very little lubrication possible. The Tension Bushes are hollow cylinders slotted along their length and made of special heat-treated spring steel of high elasticity and great wear resistance. These bushes are held in place by spring tension and can be easily exchanged when worn. They



Gillen Tension Bush

are used in many applications in the railway, farm implement, road building and construction machinery industries.

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FULL FLOATING TOOLHOLDERS

Tool-Flex Full Floating Toolholders were designed to fill a very important requirement in making tooling setups



MITY-MIDGET

Cut sanding costs as much as 75% (over hand sanding), with National's Mity-Midget . . . the original orbital action sander. Weighs only 4 lbs . . . yet has 25 sq. in. of abrasive area. Powerful . . . vibrationless. Write for complete catalog, today.



Write for complete catalog
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RICO has a complete line of:
 • Quality rotary carbide & HSS tools
 • Available for immediate delivery
 • Big savings on new tool costs
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 • Special tools to specifications
 • Distributor inquiries invited about
 better profit margins with RICO
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RICO

Attach ad to your letterhead for more information.

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5915 DIXIE HWY. • SAGINAW, MICH.

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THE FINEST
STANDARD
**BRIGHT and
HEAT TREATED
CAP SCREWS**

AS WELL AS

**PRECISION
MILLED-FROM-THE-BAR
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COUPLING BOLTS and STUDS**

ARE PRODUCED BY

W^m H. Oetemiller Co.

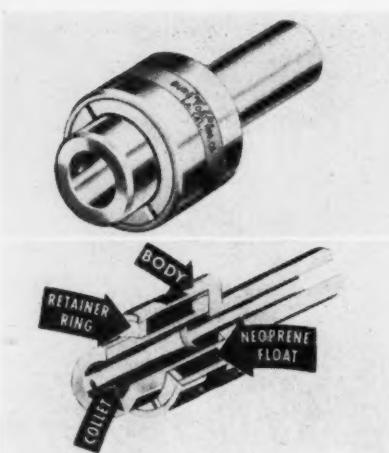
YORK, PENNA.

Precision Milled Specials? Of Course!
We'll be glad to
quote on yours — promptly.

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288 modern machine shop

new shop equipment . . .



Burgmaster Tool-Flex Floating Toolholder

on drilling, counterboring, spotfacing, reaming and tapping machines, and even openside boring mills. Tool-Flex Toolholders, manufactured by Burgmaster Corp., 15001 South Figueroa St., Box 311, Gardena, Calif., automatically compensate for parallel and angular machine spindle misalignment. Setups are more rapidly accomplished, because it is not necessary to make completely accurate spindle adjustments. The full floating feature corrects for small misalignment and assures accurately machined parts.

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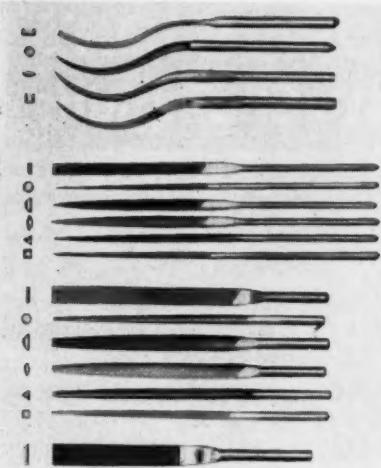


"QUICK-ACTING", "STURDY", "SAFE", "PRECISION BUILT" for "LONG LIFE", "PRICED LOWER", DEALERS IN ALL PRINCIPAL CITIES.

J. E. MARTIN MACHINE CO.
Springfield FAIRFAX-23121 Ohio

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September, 1959



View of Engis Swiss Pattern Steel Files

RIFFLERS FEATURED IN LINE OF FILES

For use with the Di-Profiler Reciprocating Hand Machine, Hyprez Division, Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill., has developed a complete line of Swiss Pattern Steel Files in 3/32 and 1/8 inch shank, all 4 inches long.

Featured in the line is a series of single-end rifflers with 1/8 inch shank, available in flat, round, crossing and square shapes—cuts No. 00 and No. 1.

Used with the Di-Profiler, these steel rifflers assure an important saving in filing time, yet retain the feel of hand operation on intricate or hard-to-get-at work.

Straight files are available in six shapes, both shank sizes, No. 00 and No. 1 cuts.

For more data circle 153 on Postpaid Card

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CARBIDE CUTTER

M. A. Ford Mfg. Co., Inc., Davenport, Iowa, has developed a unique

COLD EXTRUSION HOBBLING!

Here At
Last!

Intricate Shaped
Cavities are
Produced by
Cold Extrusion to
Precision Accur-
acy . . .

Cavities that
would be totally
impractical to machine are now produced
in a single operation and in any quantity.
Technique applied to copper, aluminum and
hobbing steel.

lower cost—closer tolerances.



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ANTON MACHINE WORKS

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CONCAVE ATTACHMENT

Imtco Bilz turning attachments

For machining of CONVEX and CONCAVE surfaces on any lathe of standard design.

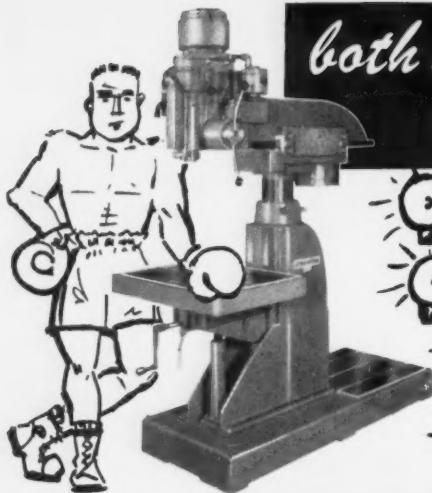
- CONVEX: Five sizes, for the turning of external spherical shapes up to 20" dia.
- CONCAVE: Five sizes, for machining of internal spherical shapes on plane or cylindrical surfaces.
- UNIVERSAL: Two sizes, for convex and concave shapes up to 12" dia.

Dealer inquiries invited — Literature Free.

INTERNATIONAL
MACHINE & TOOL CORP.
P. O. BOX 3595 • CRANSTON 10, R. I.

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modern machine shop 289



both JOHANSSON'S are Champions

KNOCK-OUTS . . . knocks out more work than any three ordinary drills.

PACKS A 1, 2, 3 PUNCH . . . slides, elevates and rotates.

TAKES ALL COMERS . . . has table for small work and platform for large work.

CHAMPION . . . a real champion that has never been stopped . . . finishes off toughest job quickly and easily.

Write today for catalog #359 that will show you how the JOHANSSON RADIAL DRILL will become the "champ" in your tool room or plant.

I. O. JOHANSSON CO.
7246 ST. LOUIS AVE., SKOKIE, ILL.

**JOHANSSON
MACHINE TOOLS**

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WORK **ALL THE ANGLES** SHEAR, NOTCHER and BENDER



CAPACITY

All sizes of Angle Iron up to and including 2" x 2" x 1/4"

**WHITNEY-JENSEN
No. 455
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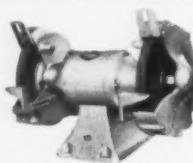
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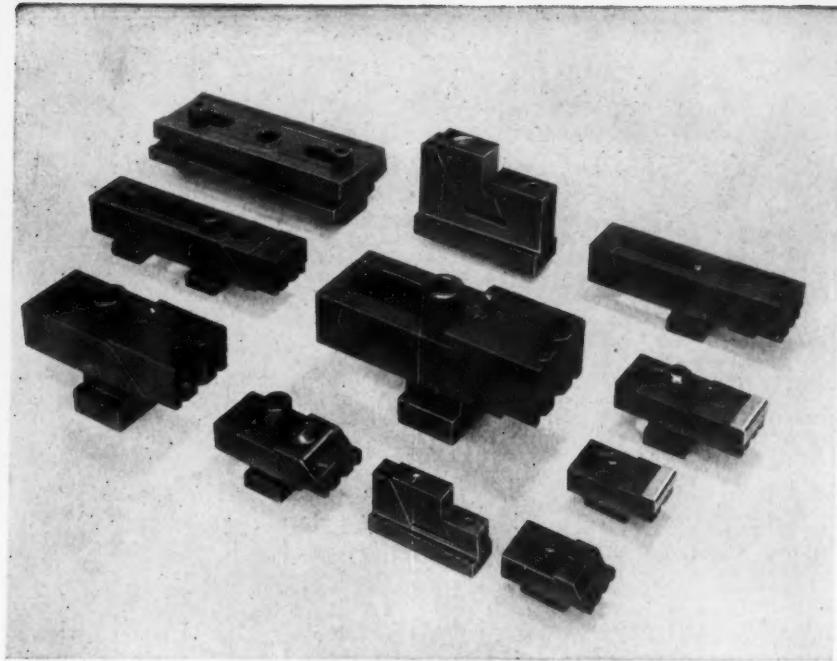
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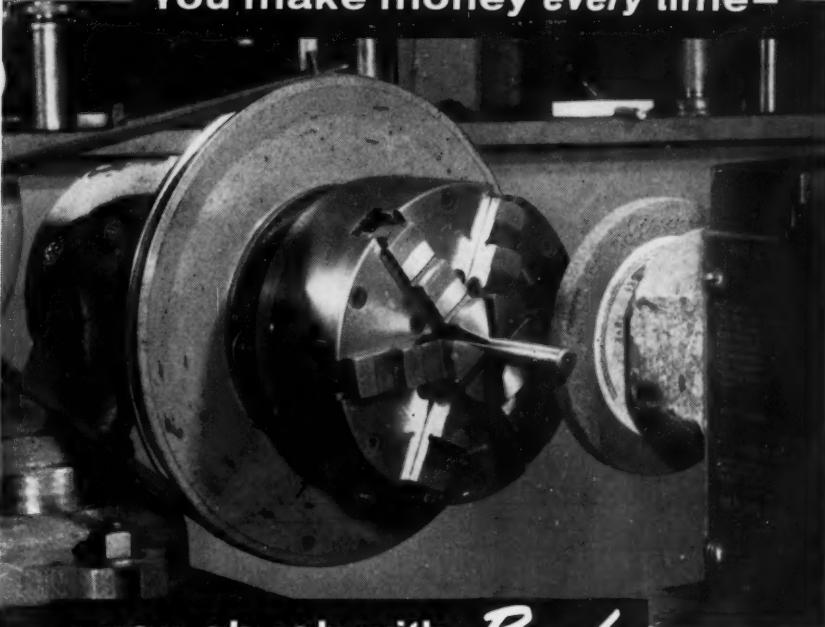
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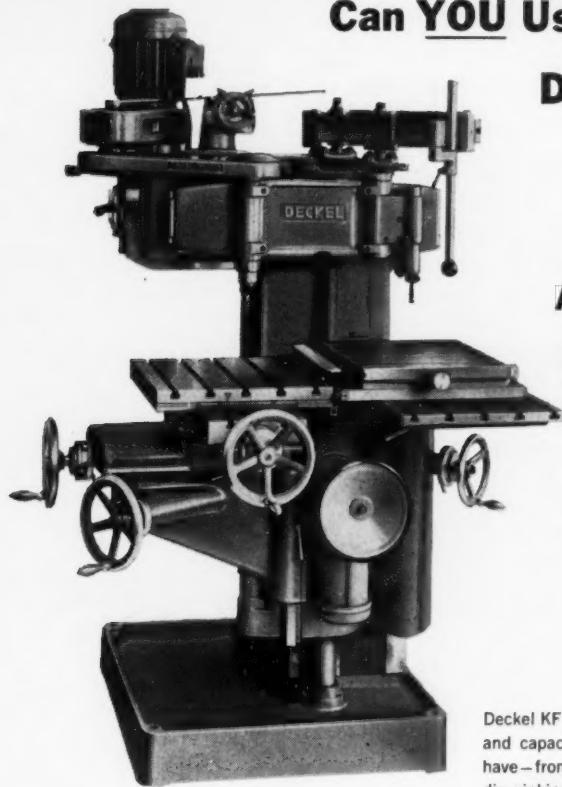
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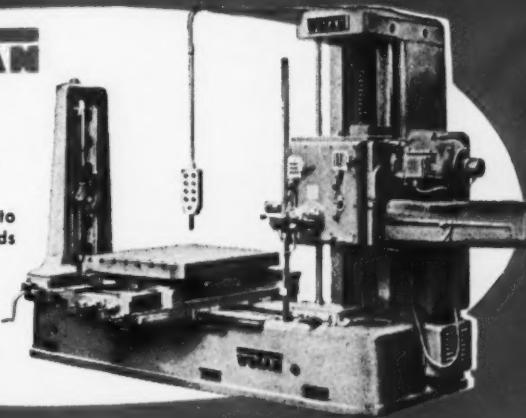
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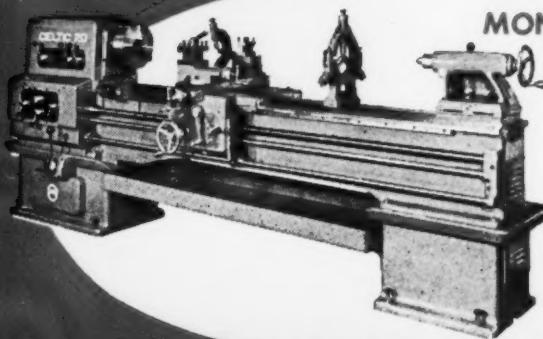
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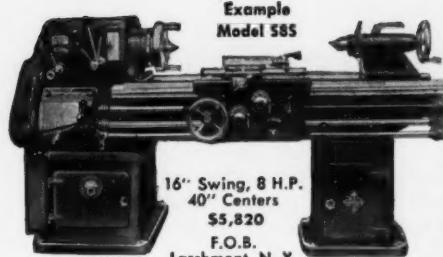
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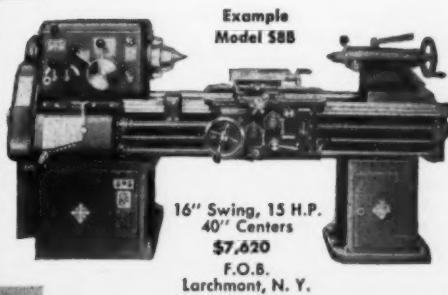
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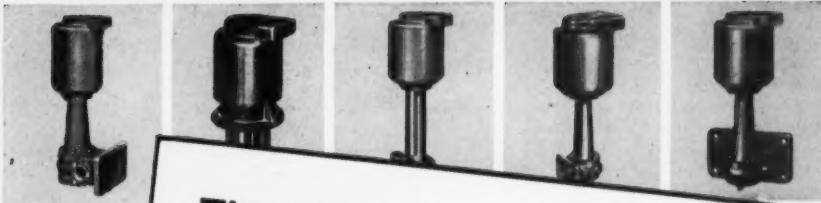
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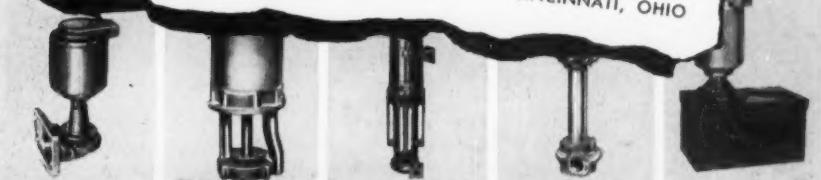
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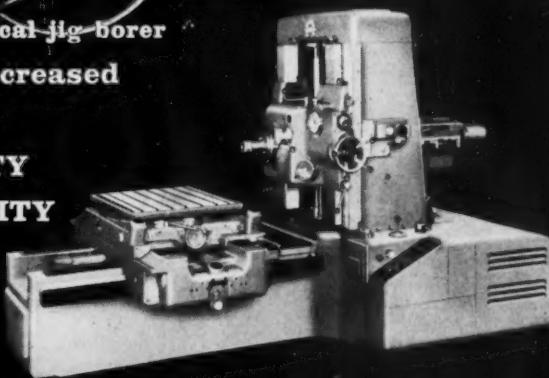
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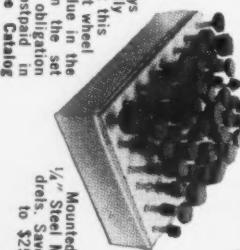
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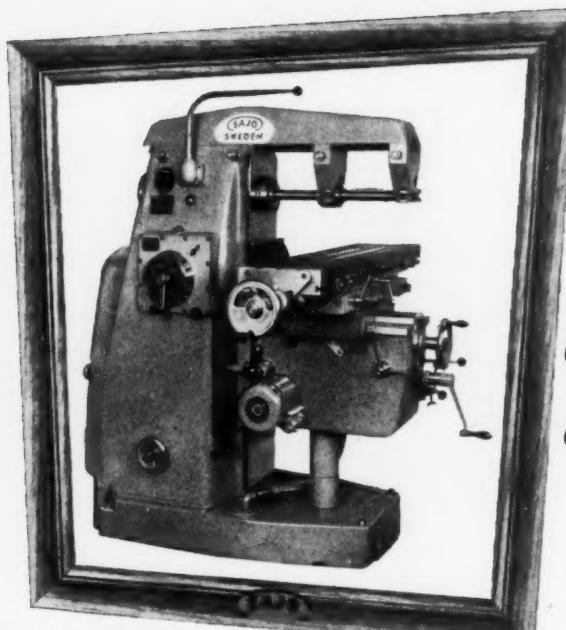
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